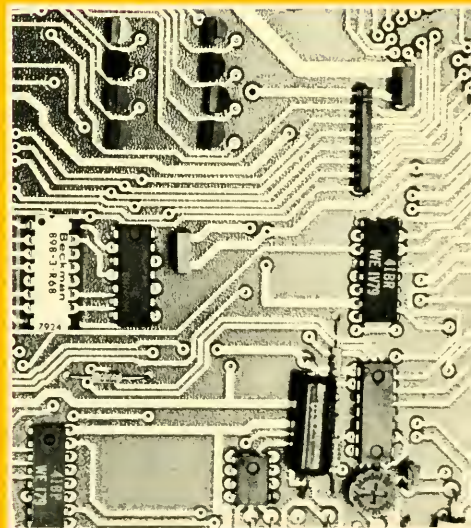


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Graduate School of Engineering

Student Guide and Catalogue 1986/87

Northeastern
University
Boston,
Massachusetts



Graduate School of Engineering

Northeastern

University

Boston,

Massachusetts

Dear Graduate Student:

This Student Guide and Catalog is developed for your convenience in program planning. We are now in the second year of the new numbering system for courses. For convenience we have retained the old number in those courses where it is applicable.

The Graduate School of Engineering has offices in room 130 Snell Engineering Center. During the fall, winter and spring quarters it is staffed from 8:30 AM to 4:30 PM, Monday through Friday. During the summer we are staffed from 8:00 AM to 5:30 PM, Monday through Thursday. Administrative matters should be referred to us. The staff consists of:

David R. Freeman, Assoc. Dean and Director
Stephen L. Gibson, Assistant Director
Lisa M. Clasby, Administrative Assistant
Frances McQueen, Secretary

You may reach this office by calling (617) 437-2711.

David R. Freeman
Associate Dean and Director
Graduate School of Engineering

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THE UNIVERSITY

PRESIDENT'S MESSAGE

We are pleased that you have selected Northeastern as the university for your graduate studies. Our graduate programs offer students academic excellence in an environment oriented to both scholarship and practical skills. The University is committed to having the highest quality faculty and to supporting research in all its disciplines.

Northeastern University offers a variety of programs within each of its nine graduate and professional schools. Each program has been designed to meet the interests and needs of graduate students and the professional climate of the 1980's. As a graduate student at Northeastern, you will find yourself working with students from diverse personal and geographic backgrounds, but with a common commitment to search and learn. These elements, in combination with our Boston location and proximity to many cultural attractions, help foster an exciting educational environment.

I wish you great success in your chosen program of study and look forward to greeting you at Northeastern.

Kenneth G. Ryder
President

GRADUATE DEGREES AND PROGRAMS AT NORTHEASTERN UNIVERSITY

Graduate School of Arts and Sciences

Master of Arts

Economics
English
History
Journalism
Political Science
Psychology: Applied Behavioral Analysis
Sociology
Social Anthropology

Master of Science

Biology
Chemistry
Economic Policy and Planning
Law, Policy & Society*
Mathematics
Physics

Master of Science in Health Science

Master of Public Administration

Master of Journalism

News Media Management

Master of Technical and Professional Writing

Doctor of Philosophy

Biology
Chemistry
Economics
Law, Policy & Society*
Mathematics
Physics
Psychology: Experimental Psychology
Sociology

Certificate of Advanced Graduate Study

Advanced Literary Study

Nondegree Certificate Program

Economics of Manpower and Development Planning
Technical Writing Training Program

Graduate School of Boston-Bouve College
of Human Development Professions

Master of Education

Consulting Teacher of Reading
Counseling
Curriculum and Instruction
Educational Research
Human Development
Rehabilitation
Special Education

Master of Science

Counseling Psychology
Physical Education
Physical Therapy
Recreation Management
Speech-Language Pathology and Audiology

Certificate of Advanced Graduate Study

Counseling
Educational Administration
Rehabilitation

Doctor of Education

Leadership: Administration and Supervision
Counseling
Educational Administration
Rehabilitation Administration

Non-Degree Programs

Elementary and Secondary Education
Moderate and Severe Special Needs

Graduate School of Business Administration

Master of Business Administration

Cooperative Education MBA Program
Full-time MBA
Part-time MBA
High Tech MBA
Executive MBA

Non-Degree Certificate Programs

Advanced Study in Business Administration

Graduate School of Computer Science

Master of Science in Computer Science

Artificial Intelligence
Communications and Networks
Databases
Interactive Systems Design
Systems Software
Theory

Graduate School of Criminal Justice

Master of Science in Criminal Justice

Administration and Planning
Criminology and Research
Security Administration
Multidisciplinary Concentration

Graduate School of Engineering

Master of Science

Chemical Engineering
Civil Engineering
Computer Systems Engineering
Electrical Engineering
Engineering Management
Industrial Engineering
Information Systems
Mechanical Engineering
Transportation*

Master of Science (unspecified)

Engineer Degree

Electrical Engineering
Industrial Engineering
Mechanical Engineering

Doctor of Engineering

Chemical Engineering

Doctor of Philosophy

Chemical Engineering
Civil Engineering
Electrical Engineering
Industrial Engineering
Mechanical Engineering

Pharmacy and Allied Health Professions

Master of Science

Biomedical Science
Hospital Pharmacy
Medical Laboratory Science
Medicinal Chemistry
Pharmacology

Master of Health Professions

General Option
Health Policy
Physician Assistant
Regulatory Toxicology

Doctor of Philosophy

Biomedical Science with specialization in

Medical Laboratory Science
Medicinal Chemistry
Pharmaceutical Sciences
Pharmacology
Toxicology

Doctor of Pharmacy

Non-Degree Certificate Programs

Health Record Administration
Medical Technology
Physician Assistant
Respiratory Therapy

Professional Schools

Graduate School of Professional Accounting

Master of Science in Accounting

School of Law

Juris Doctor

* Interdisciplinary Program

** Interdisciplinary Degree Program

ABOUT NORTHEASTERN UNIVERSITY

Among the nation's largest private universities, Northeastern University distinguishes itself not only by its immutable dedication to excellence in research and study, but also by its dedication to discovering community educational needs and meeting them. The University has not attempted to duplicate the programs of other institutions, but has sought to pioneer new areas of educational service from its beginning in 1898. Northeastern's roots can be found in the "Evening Institute for Young Men," founded in Boston in 1898. Classes in Law were offered at a reasonable cost during the evening for those who worked during the day. The first evening law school in Boston quickly expanded to include other disciplines, and soon added an innovative daytime program which offered opportunities to "earn while you learn." By the time Northeastern was incorporated as a university in 1922, the school had committed itself to "cooperative education by day, adult education in the evening".

Over half century later, Northeastern University has become a large comprehensive university with eight undergraduate colleges, nine graduate and professional schools, numerous suburban campuses, and an extensive research division. Incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts, Northeastern, like other private universities, is governed by a Board of Trustees, elected by and from the Northeastern University Corporation, which is composed of about 200 distinguished business and professional men and women across the country.

Northeastern University has developed a national reputation as the leader in cooperative education. The Cooperative Plan of Education, initiated by the College of Engineering in 1909 and subsequently adopted by the other colleges of the University, enables students to alternate periods of work and study. This educational method offers students an opportunity to gain valuable practical experience as an integral part of their education and also provides the means by which they may contribute substantially to the financing of their education. Begun at the full-time undergraduate level, the Plan has been extended to the graduate level in engineering, business administration, law, professional accounting, and criminal justice.

In the field of adult education, the University offers full and part-time graduate degree programs that are specifically designed to meet the needs and interests of adults who wish to further their education. The University's nine graduate and professional schools - Arts and Sciences, Boston-Bouve College of Human Development Professions, Business Administration, Computer Science (no Doctoral), Criminal Justice, Engineering, School of Law, Pharmacy and Allied Health, and Professional Accounting - offer programs leading to Master of Science and Doctoral degrees. The School of Engineering Technology and University College offer part-time undergraduate programs leading to Associate's and Bachelor's degrees (in humanities, business administration and technical disciplines), while the Division of Continuing Education offers nondegree courses.

Northeastern University is an exciting and dynamic university in which to pursue your academic aspirations. It is also a modern, urban institution dedicated to meeting the practical challenges of the times and the community.

RESEARCH AT NORTHEASTERN UNIVERSITY

Research and scholarship are an integral part of Northeastern University's continuing efforts to promote the intellectual growth and development that help to ensure the University's continued ability to provide quality education to its students.

The first formally organized research group at Northeastern University was the Bureau of Business Research, established in 1939 to study business principles and practices. Thereafter, research efforts on campus increased so rapidly that in 1954 a Faculty Committee on Development and Coordination of Research was established to help unify and provide direction to scholarly activity at Northeastern. From an initial grant of \$10,000 awarded to the Physics Department by the Office of Naval Research in 1945, sponsorship for University research efforts has grown to involve millions of dollars each year.

Responsibility for fostering and coordinating the development of research at Northeastern currently resides with the Vice President for Research who is assisted by the University Council on Research and Scholarship and the Office of Sponsored Programs. A semi-annual newsletter entitled *Research* brings information about the research and scholarly efforts of Northeastern University's faculty and students to the University community and the general public.

Northeastern's funding for research comes from a variety of sources including the National Institutes of Health, National Science Foundation, the National Endowment for the Humanities, IBM, Dow Chemical, and the Mellon Foundation. The University also contributes to many research projects through its own Research and Scholarship Development Fund.

Northeastern University has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institutes of Health Research Awards. Faculty members lecture the world over. In addition, many faculty members serve as U.S. government consultants and participate on a variety of national and international committees.

Current research activities span almost every academic field and include laboratory projects, theoretical studies, and technological applications. Research is under way in the areas of business, physical and biological science, social science, humanities, allied health professions, and engineering. Student participation in these activities can take place as part of regular academic programs in the form of specially designed independent studies or through cooperative work assignments. Research involvement is actively encouraged and is limited only by the student's own motivation and curiosity.

University Institutes and Research Centers

Northeastern University has also established a number of interdisciplinary institutes and research centers to provide administrative support and coordination for research efforts in key areas. The following are among those included in this category:

- Cooperative Education Research Center
- Center for Applied Social Research
- Arts and Sciences Center for Asian Studies
- Barnett Institute for Chemical Analysis and Materials Science
- Electron Microscopy Center
- Arts and Sciences Humanities Center
- Center for Electromagnetics Research
- Center for Labor Market Studies
- Marine Science and Maritime Studies Center
- Center for Medical Manpower Studies
- Arts and Sciences Center for Urban Studies
- Center for Urban and Regional Economic Studies
- Center for Integration of Engineering and Manufacturing
- Center for the Study of Sport in Society

Scholarly Journals

Several scholarly journals originate from Northeastern. These include: Studies in American Fiction; the New England Quarterly; The Scribnerian, Journal of Sports and Social Issues; Tennessee Williams Review; Romanticism: Past and Present; Health Values: Achieving High-Level Wellness.

NORTHEASTERN UNIVERSITY IN BOSTON

Historically, the city of Boston has played a pioneering role in American education. Today it has one of the largest and most diverse student populations in the country. Within a 25 mile radius of Northeastern University's campus are over 50 degree-granting institutions.

As a graduate student at Northeastern University, you will discover that part of the adventure of studying in Boston is exploring the cultural, educational, historical, and recreational offerings of the city. Northeastern is very much an urban university, and Boston is one of its richest resources.

Boston is both a city of tradition and a city of change. Centuries-old meeting houses are located beside striking contemporary office buildings and large-scale civic projects. This diversity is reflected in the cultural life of the city as well. Within a short distance of the campus are numerous renowned cultural centers such as Symphony Hall, the Museum of Fine Arts, the Isabella Stewart Gardner Museum, Horticultural Hall, and the Boston Public Library. Theater in Boston includes everything from pre-Broadway tryouts to experimental and college productions.

For those interested in sports, the Red Sox, Boston Celtics, Boston Bruins, and New England Patriots play all their home games in and around the Boston area.

The University is adjacent to the Fenway, a spacious and naturalistic park designed near the turn of the last century by Frederick Law Olmstead, the world famous landscape architect, that includes a beautiful rose garden and paths used extensively by Northeastern joggers.

Cape Cod and the North Shore are easily reached by car or public transportation for swimming, surfing, and boating. The scenic areas of northern New England are accessible for skiing, hiking, and mountain climbing.

Boston provides its student population with a stimulating environment in which to learn and grow. In turn, the considerable influence of its universities, colleges, and their student populations provides Boston with a young, vibrant and exciting ambience, quite possibly unequalled anywhere else.

FINANCIAL INFORMATION

Tuition and Fees

The tuition rate for students enrolled in the Graduate School of Engineering for the 1986-87 academic year is \$200 per quarter hour of credit. Doctoral candidates making active use of University resources while in residence are charged an additional \$600 per quarter residency for three quarters, while those registered for dissertation work being performed off campus must pay a \$300 fee in addition to tuition. A continuation fee, equivalent to the tuition cost for one-half a quarter hour of credit for Master of Science and Engineer Degrees and one quarter hour of credit for Doctorate, is charged to students who have completed their course requirements but not their thesis requirements.

Tuition statements are mailed to students by the Bursar's Office and are payable by cash or check to Northeastern University on or before the date specified.

Other fees include a charge of \$50 for late payment of tuition, a nonrefundable University Health Service fee of \$300 each year for full-time students, a graduation fee of \$35 for all degree candidates, and a Student Center fee of \$12.50 per quarter for full-time students, and \$.75 per quarter for part-time students enrolled in courses on the Boston campus.

Complete information regarding tuition and fees is provided in the current brochure Graduate School Expenses. Students should note that tuition rates and fees are subject to revision by the University's President and Board of Trustees at any time and may change eventually.

Tuition refund and procedures for withdrawal from courses is provided in section A5 under the Academic Policies and Procedures section of this student guide.

FINANCIAL ASSISTANCE

Northeastern University offers graduate students a variety of means for obtaining financial assistance. In addition to various types of assistantships awarded by the individual graduate schools, the Office of Financial Aid administers several forms of financial aid. A limited number of fellowships are also available to minority students through the African-American Institute, and each year there are also part-time residence hall staff positions available.

Graduate Assistantships

Of special interest to full-time graduate students are the variety of assistantships and fellowship programs. Awards are based on a student's previous academic performance. Assistantship applications are available from the Graduate School of Engineering Office.

Teaching and Administrative Assistantships offer a \$6,700 stipend and a \$4,800 tuition scholarship for a nine-month (September to June) appointment. These awards require the performance of teaching or administrative functions for approximately twenty hours a week.

Research Fellowships for Master of Science degree and doctoral candidates, including National Institutes of Health and National Science Foundation grants, are offered through a number of departments. Graduate students who perform research work for the department usually receive a compensatory stipend of \$6,700 for a nine-month appointment in addition to tuition remission.

Northeastern University Tuition Assistantships (NUTA) provide up to \$4,800 in tuition remission. The nine-month appointment is in exchange for ten hours per week of work.

Acceptance Conditions for Graduate Assistantships

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council: Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

Financial Aid Programs

The Office of Financial Aid offers several types of assistance to graduate students. All awards are based on financial need. Since the majority of these awards are sponsored by the Federal Government, the amount of aid granted is dependent upon the amount of funds allocated to Northeastern University each year.

In order to meet application deadlines for financial aid, students may have to apply for before they have been offered admission to the Graduate School. However, only those students who are accepted will be reviewed for financial aid. In addition, the University only awards financial aid to students who are U.S. citizens and permanent residents of the United States. Students who are studying in the United States on student visas are not eligible for federal assistance.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants for financial aid must file a GAPSFAS form in order to be considered. Northeastern University's Graduate Schools Financial Aid application and transcripts of financial aid history from other schools attended are also required. All application forms are available from the Office of Financial Aid, 254 Richards Hall.

National Direct Student Loan

This program is available to full-time graduate students who show a high level of financial need. Graduate students may borrow up to \$12,000 during the course of their entire educational careers. Repayment and interest do not begin until six months after the student ceases to carry at least a half-time academic load. Repayment may be extended over a ten year period with an interest rate of five percent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, VISTA, or while working as a full-time volunteer for a tax-exempt charitable organization.

College Work-Study Program

This program is available to full-time graduate students who show financial need. It is designed to give students an opportunity to earn as much as \$5.75 per hour working on jobs on or off campus in public or private nonprofit organizations. This program is administered solely by the Office of Financial Aid and should not be confused with the University's Cooperative Education Program.

Guaranteed Student Loan Program

Under this program, students whose families have adjusted gross incomes under \$30,000 may borrow money for educational expenses from banks or other private lending institutions. Students whose families have adjusted gross incomes which exceed \$30,000 may also borrow if they can show financial need in accordance with guidelines established by the U.S. Department of Education. Students must be enrolled on at least a half-time basis to be eligible for these loans. Terms and conditions of these loans vary from state to state. Repayment, which begins six months after the student ceases to carry at least a half-time load, may be extended for as long as ten years. The interest rate during repayment is nine percent per annum. No repayments are required for up to three years while the borrower is serving in the Armed Forces, Peace Corps, VISTA, or while working as a full-time volunteer for a tax-exempt charitable organization. Information and applications are available for lenders, state guarantee agencies, and regional offices of the U.S. Department of Education. Massachusetts residents may contact the Office of Financial Aid for more information.

Please Note: This information is current as of the date of this publication. All federal programs are subject to change. Please check with the Office of Financial Aid to determine the status of Financial Aid programs at the time you plan to enroll.

Scholarships

Northeastern University Minority Fellowships (NUMF) are to assist a limited number of minority students accepted for full-time study in the Graduate Schools of the University. The awards are made to students who demonstrate superior academic achievement and are competitive within each graduate school. Stipends cover tuition and fees. Applications may be obtained from the Graduate School Office.

Massachusetts Graduate Student Grant Program. This fund is provided by the Commonwealth of Massachusetts to assist needy residents pursuing Masters or Doctoral degrees on a full-time basis. The commonwealth has specified that Law, Pharmacy, and specific medical programs will not be eligible. Students must take a minimum of 9 credit hours per quarter to be eligible. The grants are also restricted to permanent Massachusetts residents, defined as those who have a permanent address in Massachusetts and have been living in Massachusetts for other than educational purposes for two full years prior to beginning the graduate program. The maximum grant is \$4000, although awards vary depending on available funding and comparative financial need.

A limited number of full-time Martin Luther King, Jr., Scholarships are available. These Scholarships pay the recipient's full tuition and fees during the course of satisfactory graduate work. Further information and applications are available at the African-American Institute, Northeastern University, 40 Leon Street, Boston, Massachusetts 02115 and at the Office of Financial Aid, 254 Richards Hall.

Residence Hall Staff Positions

A limited number of residence staff positions in housing facilities are available each year. Appointments carry a minimum compensation of room and board. Further information may be obtained from the Office of University Housing, 104-106 Ell Building.

Graduate Cooperative Education

The Graduate Program in Engineering offers the opportunity for Cooperative Education to its students. The number of offerings available to domestic students is limited and further restrictions are placed on international student placement. Students in the cooperative education option for graduate study may elect to follow either an alternating or a parallel schedule, according to availability. Both programs necessitate a minimum commitment of eighteen months for completion of Master of Science degree requirements.

The alternating schedule is sequenced to include full-time co-op employment for three- or six-month periods interspaced with periods of classroom study on a full-time academic basis of twelve to fourteen quarter hours minimum each quarter. The parallel schedule allows the graduate student to work simultaneously, approximately twenty hours per week, while carrying a minimum academic load of eight quarter hours per quarter.

GRADUATE SCHOOL OF ENGINEERING

GENERAL INFORMATION

The Graduate School of Engineering offers degree programs designed to present the opportunity for students to prepare themselves for technical positions in industrial organizations, government laboratories, research laboratories, and educational institutions.

In addition to extensive day graduate programs, the Graduate School of Engineering offers Master of Science, Engineer Degree, and Doctoral Degree programs on a part-time basis in the evening to engineers working in industry. An interdisciplinary Doctor of Philosophy is also available for graduate students whose interests overlap two or more departments. All full-time day graduate programs in the five departments are offered at the Boston campus. The evening graduate programs offered through the Department of Electrical and Computer Engineering and the Department of Industrial Engineering and Information Systems are available at both the Boston campus and the suburban Burlington campus. The other three departments offer their evening graduate programs at the Boston campus only.

Northeastern awards credit on a quarter-hour basis, with one quarter-hour credit roughly equivalent to three-fourths of a semester hour. The Master of Science degree requires a minimum of forty to forty-eight quarter-hour credits, depending on the specific program selected. In some cases, depending upon academic background, prerequisite courses are required. Part-time students who normally carry four quarter hours each term can generally complete their programs in three and a half to four years, while full-time students, who may take twelve to sixteen quarter hours each term, can earn their degrees in as little as one year. However, full-time students receiving some form of tuition assistantship or who are enrolled in the co-op plan or the Master of Science in Information Systems program must usually devote two years to completing their academic requirements.

The Master of Science degree with specification is granted to students who have earned a baccalaureate degree in the same engineering discipline as their graduate program. However, students who are admitted to the Industrial Engineering and Information Systems Department are exempted from this general policy and may earn the specified degree regardless of their undergraduate training. Students holding undergraduate degrees in disciplines that do not correspond to their graduate program or that have been conferred by colleges outside the United States are awarded the Master of Science degree without specification upon completion of their program requirements.*

*In some cases, the specified degree in civil engineering is granted to students who hold undergraduate degrees from overseas institutions.

SPECIAL PROGRAMS IN ENGINEERING

Women in Engineering

The Women in Engineering Program offers the opportunity for educational preparation to women who seek advanced professional positions in the field of computer or electrical engineering, but who lack the necessary background. The program leads to a Master of Science degree with a concentration in computer engineering, or in some cases to the Master of Science in Electrical Engineering degree. It is designed for women with undergraduate degrees in nonengineering areas such as mathematics, physics, natural science, and mathematics or science education. Graduate study is offered on a full- or part-time basis.

An individual educational program is developed for each student. The program includes a transitional educational experience designed to provide students with Master of Science degree program prerequisites. Women in Engineering also sponsors a series of career development seminars and other support services that address issues of specific interest to women planning a new career in engineering.

Women in Information Systems

The Women in Information Systems Program leads to a Master of Science in Information Systems degree. The program is designed for professional women with nontechnical degrees who seek the opportunity for a career move into the computer industry.

The program's goal is to provide a complete career transition in a short time frame by building new technical skills on the knowledge and professional experience base that students have previously acquired. The program begins with an initial full-time academic commitment of six months. Students are then offered help in locating co-op jobs where they will be expected to work forty hours a week earning industry-competitive, entry-level salaries while completing their Master of Science degree on a part-time basis. The entire program is designed to take two and one-half years to complete.

Industrial Fellowship Program

The Industrial Fellowship Program is a one-year Master of Science program in electrical and computer engineering. Students are selected and sponsored by their companies to attend a full-time graduate program for two to three days a week while retaining their full-time employment in the remaining days. The program is completed with a thesis in the summer months. The thesis topic is directly related to company work, and is jointly supervised by an industrial manager and an academic advisor.

Instructional Television Fixed Service

Daytime graduate courses in electrical engineering, mechanical engineering, and industrial engineering and information systems are broadcast live to companies that are members of Network Northeastern. An interactive audio system is a unique linkage feature between the classroom and the ITFS student. The ITFS program is geared to the part-time graduate student in industry. A student may also pursue evening classes at either the Boston campus or the suburban Burlington campus.

Degree Programs in Engineering

Computer Systems Engineering

CAD/CAM

Robotics

Engineering Software Design

Department of Chemical Engineering

Master of Science in Chemical Engineering or Master of Science (unspecified)

Doctor of Engineering

Doctor of Philosophy

Department of Civil Engineering

Master of Science in Civil Engineering or Master of Science (unspecified)

Environmental Engineering

Structures and Materials

Construction Engineering

Geotechnical Engineering

Transportation

Master of Science in Transportation (interdisciplinary)

Doctor of Philosophy

Department of Electrical and Computer Engineering

Master of Science in Electrical Engineering or Master of Science (unspecified)

Computer Engineering

Communications and Signal Processing

Control and Signal Processing

Fields, Waves and Optics

Electronic Circuits and Semiconductor Devices

Power Systems

Computer Science

Electrical Engineer

Doctor of Philosophy

Department of Industrial Engineering and Information Systems

Master of Science in Industrial Engineering

Computer and Information Systems

Operations Research and Reliability Analysis

Manufacturing Systems

Master of Science in Engineering Management

Computer and Information Systems

Operations Research and Reliability Analysis

Master of Science in Information Systems

Industrial Engineer

Doctor of Philosophy

Department of Mechanical Engineering

Master of Science in Mechanical Engineering or Master of Science (unspecified)

Thermofluid Engineering

Material Science and Engineering

Mechanics

Mechanical Engineer

Doctor of Philosophy

Interdisciplinary Doctor of Philosophy

INTERDISCIPLINARY PHD PROGRAM

The Graduate School of Engineering offers the opportunity for an interdisciplinary doctoral program involving substantial work in two or more departments. A written proposal describing the areas of proposed study and research would have been submitted with the student's application. Interdisciplinary study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the student's proposal. The sponsoring department is the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an advisor who will direct his or her doctoral thesis. This advisor, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the Director of the Graduate School of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the Director of the Graduate School to determine whether objectives of the program are being met.



COMPUTER SYSTEMS ENGINEERING

The Graduate School of Engineering offers an interdisciplinary program leading to the degree of Master of Science in Computer Systems Engineering. Three major areas of concentration are available. These concentrations are:

CAD/CAM Robotics Engineering Software Design

This interdisciplinary program has courses drawn from Electrical and Computer Engineering, Industrial Engineering and Information Systems, Mechanical Engineering and the College of Computer Science.

The program may be pursued on a full-time, part-time or cooperative plan. Students have the opportunity to select courses from both the day and evening offerings. Each student will be assigned an advisor based upon the area of concentration chosen.

Master of Science Degree Requirements

A minimum of forty-eight quarter hours of graduate courses with a minimum grade point average of 3.0 is required. Refer to the regulations of the Graduate School of Engineering for detailed information on academic and administrative policies.

Students holding an engineering degree from an ABET accredited institution will qualify to apply for the Master of Science in Computer Systems Engineering. Students with a Bachelor of Science in the physical sciences may also apply. A Graduate Record Examination (GRE) is required of all applicants.

Prerequisite Courses

Students are expected to be proficient in a high-level language such as Pascal or Modula-2 and in Data Structures. Students in the Robotics concentration must also have a background in LISP. Applicants lacking this background will be asked to take these courses or their equivalent and up to 4 quarter hours of prerequisite course work may be applied to the required minimum. Determination of prerequisite needs will be made at the time of admission.

The following courses may be used for the prerequisite:

- High level language
 - IIS 3106 Elements of Structured Programming
 - IIS 3115 Modula-2 for Engineers
 - COM 1100 Pascal
- Data Structures
 - IIS 3604 Data Structures
- LISP (Robotics majors)
 - COM 1102 LISP

Course Requirements

Full or Part-Time Study

Required Core Courses.....	8 QH
Subject Area Required Courses.....	20 or 24 QH
Elective Courses.....	16 or 20 QH
Minimum Quarter Hours Required.....	48 QH

Required Core Courses	Credits
ME 3500 Computer Aided Graphics and Design.....	4
ECE 3311 Software Engineering.....	4
or	
IIS 3624 Software Engineering I.....	4

Subject Area Required Courses

CAD/CAM

ECE 3451	or IIS 3103 Optimization.....	4
ME 3468	Robot Mechanics and Control.....	4
ME 3510	Manufacturing Machine Programming.....	4
IIS 3309	Computer Methods in Manufacturing.....	4
IIS 3311	Computer Aided Engineering.....	4

Robotics

COM 3410	Principles of Artificial Intelligence.....	4
ECE 3381	Classical Control Theory.....	4
ECE 3540	Digital Control Systems.....	4
ECE 3463	Robotic Sensors.....	4
ECE 3466	Intelligent Robots.....	4
ME 3468	Robot Mechanics and Control.....	4

Engineering Software Design

IIS 3625	Software Engineering II.....	4
IIS 3607	Operating Systems & Systems Software.....	4
IIS 3217	Engineering Project Management.....	4
IIS 3610	Computer Architecture.....	4
IIS 3651	Software Engineering Project.....	4

Course Descriptions

COM 3410, is described here since it is from another college; all other courses will be found in the section appropriate to the course prefix.

Prefix to Course

ECE
IIS
ME

Department

Electrical and Computer Engineering
Industrial Engineering and Information Systems
Mechanical Engineering

COM 3410 Foundations of Artificial Intelligence (4QH)

Searching, goals, and plans. Heuristics. Representation of knowledge: nets, frames, and inheritance. Logic and its role in Artificial Intelligence. Selected applications of these ideas in other areas of Artificial Intelligence. Prep. Working knowledge of LISP.

Advisors

CAD/CAM

Robotics

Engineering Software Design

Prof. Zeid

Prof. Proakis

(A-L) Prof. Mourant

(M-Z) Prof. Kokar

DEPARTMENT OF CHEMICAL ENGINEERING

The Department of Chemical Engineering offers the degrees of Master of Science in Chemical Engineering, Master of Science without specification, Doctor of Engineering, and Doctor of Philosophy. The Master of Science degree in Chemical Engineering may be pursued on either a full-time or a part-time basis. A full-time student may apply for participation in the Cooperative Plan. The Master of Science degree without specification must be pursued on a continuous full-time basis. The Doctor of Engineering and Doctor of Philosophy degrees are pursued on a continuous full-time basis consistent with the residence requirements for the degree.

Full-time Master of Science students and Doctoral candidates are able to select thesis topics from a diverse range of faculty research interests. Graduate student seminars are held on a regular basis and provide an interactive forum for learning about departmental research and exchanging ideas. Most courses are offered in the late afternoon or early evening to make them readily accessible to part-time students pursuing full-time industrial careers.

Master of Science students wishing to switch their status from part-time to full-time must notify the Chemical Engineering Department and make formal petition with the Graduate School of Engineering. Such requests are usually granted for the full-time program to begin in the fall quarter. Please refer to the regulations of the Graduate School of Engineering for information on academic and administrative policies.

Master of Science Degree Requirements

A minimum of 40 quarter hours of academic work is required of all students. A thesis of ten quarter hours of credit and one seminar course are required of all continuous and cooperative full-time students who qualify for the Master of Science in Chemical Engineering, in addition to the required courses. The sequence of courses which students take on this plan is established by their advisor. Part-time students may progress according to their abilities within the seven year time limit. The thesis and seminar course are not required for part-time students and unspecified Master of Science degree candidates.

A Master of Science in Chemical Engineering will be awarded to those students with a Bachelor of Science in Chemical Engineering or a closely-allied engineering field. Students with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may qualify for the degree of Master of Science with specification. Such students are required to complete supplementary undergraduate work, which is not included in the minimum course requirements, on a full-time (non-cooperative education) basis.

Course Requirements

Master of Science Master of Science

	Thesis Option	Non-Thesis Option
Required Core Courses.....	12 QH	12 QH
Master of Science Thesis.....	10 QH	0 QH
Seminar.....	2 QH	0 QH
Elective Courses.....	16 QH	32 QH
Minimum Quarter Hours Required*.....	40 QH	44 QH

*exclusive of any preparatory courses

Required Core Courses (20H equivalents are in parentheses)		Credits
CHE 3300 (3301,3302)	Chemical Engineering Mathematics.....	4
CHE 3310 (3311,3312)	Chemical Engineering Thermodynamics.....	4
CHE 3320 (3321,3322)	Separation Processes.....	4
CHE 3330 (3331,3332)	Chemical Process Control.....	4
CHE 3340 (3341,3342)	Heterogeneous Catalysis.....	4
CHE 3350 (3351,3352)	Chemical Process Heat Transfer.....	4

Master of Science Thesis CHE 3860.....10

Seminar CHE 3690.....2

Elective Courses

CHE 3400 (3401,3420)	Advanced Chemical Engineering Calculations....	4
CHE 3410 (3411,3412)	Numerical Techniques in Chemical Engineering...	4
CHE 3430	Chemical Data Estimation.....	2
CHE 3450	Analytical and Numerical Techniques.....	4
CHE 3500 (3501,3502)	Transport Phenomena.....	4
CHE 3510 (3511,3512)	Modeling and Simulation of Chemical Processes..	4
CHE 3520 (3521,3522)	Computer Process Control.....	4
CHE 3530 (3531,3532)	Adv. Management Techniques in Chemical Ind....	4
CHE 3540 (3541,3542)	Advanced Plant Design Concepts.....	4
CHE 3543	Advanced Plant Design Concepts.....	2
CHE 3560 (3561,3562)	Fluid Mechanics.....	4
CHE 3600 (3601,3602)	Polymer Science.....	4
CHE 3620 (3621,3622)	Principles of Polymerization.....	4
CHE 3630 (3631,3632)	Chemical Process Pollution Control.....	4
CHE 3660	Solar Energy Thermal Processes.....	2
CHE 3663 (3664,3665)	Fundamentals of Polymer Processing.....	4
CHE 3670 (3701,3702)	Special Topics in Chemical Engineering.....	4
CHE 3671 (3672,3673)	Kinetics of Chemical Processes.....	4
CHE 3680	Corrosion Fundamentals.....	2

The Doctor Degrees

The Chemical Engineering Department offers the degrees of Doctor of Philosophy and Doctor of Engineering. These programs are offered on a continuous full-time basis. The following material outlines the requirements for both doctoral programs; detailed descriptions of the dissertation for the PhD and the engineering problem for the DEng are presented separately.

Qualifying Examination and Degree Candidacy

Each student admitted to the program will initially have the status of doctoral student. Successful completion of the qualifying examination is the minimum required for consideration as a doctoral degree candidate. The qualifying examination includes both written and oral parts and is normally given in the spring and the fall quarters. The oral examination will test general comprehension. The written examination, in general, will cover the following areas:

1. Thermodynamics
2. Kinetics and Reactor Design
3. Process Control
4. Unit Operations (including Transport Phenomena)
5. Process Design
6. Applied Chemistry

Course Requirements

The course requirements, in addition to the minimum requirements for establishing degree candidacy, will be determined by the departmental graduate committee.

Language Requirement

For the Doctor of Philosophy degree, the foreign language requirement may be satisfied by a reading knowledge in one language selected from French, German, or Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks. For the Doctor of Engineering degree, there is no foreign language requirement.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work after admission as a doctoral student. However, it is expected that at least two years of full-time graduate study will be required beyond the Master of Science degree.

Dissertation Prospectus/Outline

After passing the qualifying examination, the doctoral degree candidate must prepare a dissertation prospectus/outline depicting the research on an engineering problem which will be conducted, analyzed and presented in the dissertation. The cover sheet is signed by each member of the dissertation committee to indicate approval of the topic and its plan of execution.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the dissertation has been completed and approved by the dissertation advisor. This examination is based upon the subject matter of the dissertation and a defense of it.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. The final oral examination will include the subject matter of the doctoral dissertation and significant developments in the field of the dissertation work. Other fields may be included if recommended by the examination committee.

The Doctor of Philosophy Degree

Dissertation

After degree candidacy has been established, a candidate must complete a dissertation which embodies the results of extended original research and includes material suitable for publication. An individual may choose his or her dissertation topic and supervisor upon becoming a doctoral student. In most cases selection of topic will be made immediately after the student has established candidacy for the PhD degree. The student will be expected to discuss with the staff their PhD dissertation topics offerings. After these discussions, the student shall notify the advisor, the department head, and the chairman of the departmental graduate committee in writing of his or her choice of dissertation topic and advisor. The chairman of the departmental graduate committee after consultation with the advisor shall appoint an appropriate dissertation committee. This committee shall be kept informed of the progress of the dissertation and will approve the dissertation in its final form.

The Doctor of Engineering Degree

Engineering Problem

The Engineering Problem advisor will be selected by the degree candidate after consultation with the faculty. Approval of the topic for the Problem rests with the Problem advisor and the departmental graduate committee. The Engineering Problem is not a research problem but rather an engineering problem in depth. It may include elements of design, economics, business management principles, and process development. In general, it will not include laboratory investigations. Normally, the Engineering Problem will be solved on campus. Regardless of the arrangements made for the Engineering Problem, no off-campus advisor will

be approved. Only the Problem advisor will specify the nature and requirements of the Problem, and the findings and results remain the property of the advisor and the University to be published as they determine.

Faculty

Ralph A. Buonopane, Acting Chairman

Professors

Williams, John A., PhD, Case Western Reserve University; fuels

Associate Professors

Buonopane, Ralph A., PhD, Northeastern University; heat and mass transfer

Goodwin, Bernard M., ScD, MIT; computer applications

Stewart, Richard R., PhD, Clemson University; process control

Assistant Professor

McMillan, Scott T., PhD, Georgia Institute of Technology; biomedical

Willey, Ronald, J., PhD, University of Massachusetts, Amherst; heterogeneous catalysis

Advisors

MS Specified	(A-L) Prof. Stewart
	(M-Z) Prof. Goodwin
MS Unspecified	(A-Z) Prof. Buonopane
Doctoral Programs	(A-Z) Prof. Williams

CHEMICAL ENGINEERING

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine the courses that are actually offered in any given quarter and the day and time.

CHE 3300 Chemical Engineering Mathematics (4QH)

(formerly 04.802)

Fall Quarter, Alternating Years

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables. Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses. Prep. BS degree in Chemical Engineering including mathematical analysis.

CHE 3301 Chemical Engineering Mathematics I (2QH)

Fall Quarter, As Announced

CHE 3301 and CHE 3302 cover the same material with the same prerequisites as CHE 3300, but in two 2QH courses.

CHE 3302 Chemical Engineering Mathematics II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3301. Prep. CHE 3301.

CHE 3310 Chemical Engineering Thermodynamics I (4QH)

(formerly 04.811)

Winter Quarter, Alternating Years

Classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. A study of phase equilibria involving the various states of matter; prediction and correlation of physical, chemical, and transport properties of gases and liquids; elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Fundamental principles are reviewed to the extent needed. Prep. BS degree in Chemical Engineering.

CHE 3311 Chemical Engineering Thermodynamics I (2QH)

Winter Quarter, As Announced

CHE 3311 and CHE 3312 cover the same material with the same prerequisites as CHE 3310, but in two 2QH courses.

CHE 3312 Chemical Engineering Thermodynamics II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3311. Prep. CHE 3311.

CHE 3320 Separation Processes (4QH)

(formerly 04.978)

Spring Quarter, Alternating Years

Calculation and design methods used in processes involving mass transfer. Topics covered include vapor liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption and extraction. Emphasis is placed on methods and techniques which are common to many separation processes. Prep. BS degree in Chemical Engineering.

CHE 3321 Separation Processes I (2QH)

Winter Quarter, As Announced

CHE 3321 and CHE 3322 cover the same material with the same prerequisites as CHE 3320, but in two 2QH courses.

CHE 3322 Separation Processes II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3321. Prep. CHE 3321.

CHE 3330 Chemical Process Control (4QH)

(formerly 04.829)

Fall Quarter, Alternating Years

Review of classical control techniques; state variable representation and analysis of continuous control systems in chemical engineering, including controllability, observability, and stability. Multivariable control problems in chemical engineering; introduction to optimal control. Digital simulation included where appropriate. Prep. Graduate standing in Chemical Engineering or permission.

CHE 3331 Chemical Process Control I (2QH)

Fall Quarter, As Announced

CHE 3331 and CHE 3332 cover the same material with the same prerequisites as CHE 3330, but in two 2QH courses.

CHE 3332 Chemical Process Control II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3331. Prep. CHE 3331.

CHE 3340 Heterogeneous Catalysis (4QH)

(formerly 04.890)

Winter Quarter, Alternating Years

Experimental methods required for determining the surface area and pore structure of catalyst carriers are discussed. These structural characteristics are utilized to estimate mass and heat transport rates within porous catalysts in order to determine their effectiveness with respect to chemical reaction. Mechanisms for chemical poisoning of catalysts are also analyzed. Reactions of practical interest are used to illustrate the applications of heterogeneous catalysis to modern chemical processing problems. Prep. BS degree in Chemical Engineering.

CHE 3341 Heterogeneous Catalysis I (2QH)

Winter Quarter, As Announced

CHE 3341 and CHE 3342 cover the same material with the same prerequisites as CHE 3340, but in two 2QH courses.

CHE 3342 Heterogeneous Catalysis II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3341. Prep. CHE 3341.

CHE 3350 Chemical Process Heat Transfer (4QH)

(formerly 04.973)

Spring Quarter, Alternating Years

Empirical methods and calculations used to design heat transfer equipment for the chemical process industries. Review of basic heat transfer principles. Shell-and-tube calculations for liquid and/or vapor phase heat transfer. Direct contact and other special heat exchanger applications. Prep. BS degree in Chemical Engineering.

CHE 3351 Chemical Process Heat Transfer I (2QH)

Winter Quarter, As Announced

CHE 3351 and CHE 3352 cover the same material with the same prerequisites as CHE 3350, but in two 2QH courses.

CHE 3352 Chemical Process Heat Transfer II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3351. Prep. CHE 3351.

CHE 3400 Advanced Chemical Engineering Calculations (4QH)

(formerly 04.801)

As Announced

Fundamental process principles leading to an understanding of the stoichiometric principles of chemical process plants. The study of complex material and energy balances is undertaken with the view to apply these principles to actual large chemical plant conditions. Prep. BS in degree Chemical Engineering including differential equations.

CHE 3401 Advanced Chemical Engineering Calculations I (2QH)

As Announced

CHE 3401 and CHE 3402 cover the same material with the same prerequisites as CHE 3400, but in two 2QH courses.

CHE 3402 Advanced Chemical Engineering Calculations II (2QH)

As Announced

Continuation of CHE 3401. Prep. CHE 3401.

CHE 3410 Numerical Techniques in Chemical Engineering (4QH)

(formerly 04.803)

Fall Quarter, As Announced

Digital computer applications to chemical engineering problems. Topics covered include location of roots of linear and nonlinear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and to the subject of linear algebra. Prep. BS degree in Chemical Engineering.

CHE 3411 Numerical Techniques in Chemical Engineering I (2QH)

Fall Quarter, As Announced

CHE 3411 and CHE 3412 cover the same material with the same prerequisites as CHE 3410, but in two 2QH courses.

CHE 3412 Numerical Techniques in Chemical Engineering II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3411. Prep. CHE 3411.

CHE 3430 Chemical Data Estimation (2QH)

(formerly 04.832)

As Announced

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Latest empirical relationships and physical and thermodynamics laws are introduced to obtain data for plant design and other chemical and engineering uses. Prep. BS Degree.

CHE 3450 Analytical and Numerical Techniques (4QH)

(formerly 04.835)

As Announced

For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. Prep. BS degree and knowledge of digital computer programming.

CHE 3500 Transport Phenomena (4QH)

(formerly 04.823)

Winter Quarter, As Announced

Momentum rate conservation equations for steady-state fluid flow in two-dimensional boundary layers are presented and solved to obtain the fluid velocity profiles. These results are utilized in the consideration of heat and mass transfer phenomena at a fluid-solid interface. The development of surface renewal theory is presented and applied to the description of heat and mass transfer phenomena. Prep. BS degree in Chemical Engineering.

CHE 3501 Transport Phenomena I (2QH)

Winter Quarter, As Announced

CHE 3501 and CHE 3502 cover the same material with the same prerequisites as CHE 3500, but in two 2QH courses.

CHE 3502 Transport Phenomena II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3501. Prep. CHE 3501.

CHE 3510 Modeling and Simulation of Chemical Process (4QH)

(formerly 04.837)

Winter Quarter, Alternating Years

Use of special purpose and general purpose computer programs in solving the steady-state material and energy balances of chemical processes. Course includes related background material which may be applied to these computer programs such as convergence acceleration for calculations involving recycle streams, tearing recycle streams for iteration on minimum number of streams and minimum number of parameters, and algorithms for design variable selection. Prep. Graduate Standing in Chemical Engineering.

CHE 3511 Modeling and Simulation of Chemical Process I (2QH)

Winter Quarter, As Announced

CHE 3511 and CHE 3512 cover the same material with the same prerequisites as CHE 3510, but in two 2QH courses.

CHE 3512 Modeling and Simulation of Chemical Process II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3511. Prep. CHE 3511.

CHE 3520 Computer Process Control (4QH)

(formerly 04.830)

Winter Quarter, Alternating Years

Computer control hardware and software. Z-transform, pulse transfer functions, and data holds. Open and closed-loop response and design of sampled-data systems. Computer control algorithms. Digital simulation of sampled data systems. Prep. Graduate standing in Chemical Engineering or permission.

CHE 3521 Computer Process Control I (2QH)

Winter Quarter, As Announced

CHE 3521 and CHE 3522 cover the same material with the same prerequisites as CHE 3520, but in two 2QH courses.

CHE 3522 Computer Process Control II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3521. Prep. CHE 3521.

CHE 3530 Advanced Management Techniques in the Chemical Industry (4QH)

(formerly 04.840)

Fall Quarter, Alternating Years

Management techniques applied to the chemical industry. Special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. Prep. Graduate standing.

CHE 3531 Advanced Management Techniques in the Chemical Industry I (2QH)

Fall Quarter, As Announced

CHE 3531 and CHE 3532 cover the same material with the same prerequisites as CHE 3530, but in two 2QH courses.

CHE 3532 Advanced Management Techniques in the Chemical Industry II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3531. Prep. CHE 3531.

CHE 3540 Advanced Process Design Concepts (4QH)

(formerly 04.845)

Spring Quarter, Alternating Years

This course stresses techniques and approaches used in the development of new or improved processes. Topics include establishment of process bases, use of process simulators in design, optimization and evaluation of alternatives, and preliminary equipment design and cost estimating techniques. Prep. BS degree in Chemical Engineering.

CHE 3541 Advanced Process Design Concepts I (2QH)

Fall Quarter, As Announced

CHE 3541 and CHE 3542 cover the same material with the same prerequisites as CHE 3540, but in two 2QH courses.

CHE 3542 Advanced Process Design Concepts II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3541. Prep. CHE 3541.

CHE 3543 Advanced Plant Design Concepts (2QH)

Spring Quarter, As Announced

Modern approaches to plant design: computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. Prep. BS degree in Chemical Engineering.

CHE 3560 Fluid Mechanics (4QH)

(formerly 04.974)

Fall Quarter, Alternating Years

Discussion of statics, kinematics, and stress concepts associated with fluids. Formation of the general equations of motion with application to laminar and turbulent flow. Topics on boundary layer theory and compressible flow are included. Prep. BS degree in Chemical Engineering.

CHE 3561 Fluid Mechanics I (2QH)

Fall Quarter, As Announced

CHE 3561 and CHE 3562 cover the same material with the same prerequisites as CHE 3560, but in two 2QH courses.

CHE 3562 Fluid Mechanics II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3561. Prep. CHE 3561.

CHE 3600 Polymer Science (4QH)

(formerly 04.870)

Fall Quarter, Alternating Years

Basic concepts of polymers, thermodynamics of polymer solutions and measurement of molecular weight. Physical and chemical testing of polymers. Crystallinity in polymers and rheology of polymers. Physical and chemical properties of polymers. Mechanisms and conditions for polymerization of polymers including step-reaction, addition and copolymerization. Discussion of carbon-chain polymers, fibers and fiber technology. Prep. BS degree in Chemical Engineering or Chemistry.

CHE 3601 Polymer Science I (2QH)

Fall Quarter, As Announced

CHE 3601 and CHE 3602 cover the same material with the same prerequisites as CHE 3600, but in two 2QH courses.

CHE 3602 Polymer Science II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3601. Prep. CHE 3601.

CHE 3620 Principles of Polymerization (4QH)

(formerly 04.872)

Fall Quarter, Alternating Years

Introduction to polymers and polymer properties. Mechanisms of polymerization including step polymerization, radical-chain polymerization, emulsion polymerization, ionic-chain polymerization, chain copolymerization and ring-opening polymerization. Stereo chemistry of polymerization and synthetic reactions of polymers. Applications to reactor design of industrially important polymers. Prep. Graduate Standing in Chemical Engineering.

CHE 3621 Principles of Polymerization I (2QH)

Fall Quarter, As Announced

CHE 3621 and CHE 3622 cover the same material with the same prerequisites as CHE 3620, but in two 2QH courses.

CHE 3622 Principles of Polymerization II (2QH)

Winter Quarter, As Announced

Continuation of CHE 3621. Prep. CHE 3621.

CHE 3630 Chemical Process Pollution Control (4QH)

(formerly 04.850)

Spring Quarter, Alternating Years

Provides chemical engineering students with basic fundamentals for handling environmental problems in the chemical process industries. Water quality requirements and industrial waste characteristics; wastewater treatment processes applicable to environmental engineering; biological treatment processes and equipment; comprehensive design problems involving biological and tertiary treatment; the economics of water treatment and reuse. Prep. Graduate standing in Chemical Engineering.

CHE 3631 Chemical Process Pollution Control I (2QH)

Winter Quarter, As Announced

CHE 3631 and CHE 3632 cover the same material with the same prerequisites as CHE 3630, but in two 2QH courses.

CHE 3632 Chemical Process Pollution Control II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3631. Prep. CHE 3631.

CHE 3660 Solar Energy Thermal Processes (2QH)

(formerly 04.862)

Fall Quarter

Covers fundamental thermal processes involved in obtaining useful heat from flat-plate solar collectors. The components required in an active solar energy collection system are analyzed and the economics of the system are considered. Prep. BS degree.

CHE 3663 Fundamentals of Polymer Processing (4QH)

(formerly 04.871)

Winter Quarter, Alternating Years

Transport properties of polymer solutions and polymer melts. Modeling and design of polymer processing equipment. Flow models for processes involving heat, mass, and/or momentum transfer. Analysis of flow stability and elastic phenomena. Applications to the design of equipment for extrusion, calendering, coating, fiber spinning, tubular film blowing, injection molding and mixing. Prep. Graduate Standing in Chemical Engineering.

CHE 3664 Fundamentals of Polymer Processing I (2QH)

Winter Quarter, As Announced

CHE 3664 and CHE 3665 cover the same material with the same prerequisites as CHE 3663, but in two 2QH courses.

CHE 3665 Fundamentals of Polymer Processing II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3664. Prep. CHE 3664.

CHE 3670 Special Topics in Chemical Engineering (4QH)

(formerly 04.899)

As Announced

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. Prep. Permission of department staff.

CHE 3671 Kinetics of Chemical Processes (2QH)

(formerly 04.891)

Spring Quarter, Alternating Years

The theoretical foundations for the analysis of elementary chemical reaction rates, such as collision theory, particle dynamics, and transition state theory are presented. Consideration is given to the theory of monomolecular reactions and the effect of solvent and electrostatic forces on liquid phase reaction rates. Homogeneous catalysis and selected free-energy correlations are covered. Prep. BS degree in Chemical Engineering.

CHE 3672 Kinetics of Chemical Processes I (2QH)

Winter Quarter, As Announced

CHE 3672 and CHE 3673 cover the same material with the same prerequisites as CHE 3671, but in two 2QH courses.

CHE 3673 Kinetics of Chemical Processes II (2QH)

Spring Quarter, As Announced

Continuation of CHE 3672. Prep. CHE 3672.

CHE 3680 Corrosion Fundamentals (2QH)

(formerly 04.821)

As Announced

Economic factors, basic theories, types, behaviors of specific systems, and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized. Prep. BS degree.

CHE 3690 Seminar (2QH)

(formerly 04.990)

Any Quarter

Topics of an advanced nature are presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. Prep. Graduate Standing in Chemical Engineering.

CHE 3701 Special Topics in Chemical Engineering I (2QH)

Any Quarter

Topics of interest to the staff member are presented for advanced study. A student may take this course and its continuation in CHE 3702 with the same instructor.

CHE 3702 Special Topics in Chemical Engineering II (2QH)

A continuation of CHE 3701

CHE 3796 DEng Continuation (0QH)

Any Quarter

CHE 3798 Masters Thesis Continuation (0QH)

(formerly 04.9X1)

Any Quarter

CHE 3799 PhD Continuation (0QH)

(formerly 04.9X4)

Any Quarter

CHE 3860 Thesis (Master's Degree) (10QH)

(formerly 04.991)

Any Quarter

Analytical and/or experimental work conducted under the supervision of the department. 10 QH maximum credit for thesis. Students normally register in CHE 3861 or CHE 3862. Prep. Graduate Standing in Chemical Engineering.

CHE 3861 Thesis (Master's Degree) (4QH)

Any Quarter

CHE 3862 Thesis (Master's Degree) (2QH)

Any Quarter

CHE 3885 Thesis (DEng Degree) (0QH)

(formerly 04.996)

Any Quarter

Theoretical and experimental work conducted under the supervision of the department. Prep. Admission to program in Chemical Engineering.

CHE 3880 Thesis (PhD Degree) (0QH)

(formerly 04.995)

Any Quarter

Theoretical and experimental work conducted under the supervision of the department. Prep. Admission to doctoral program in Chemical Engineering.

DEPARTMENT OF CIVIL ENGINEERING

The Department of Civil Engineering offers degree programs in construction management, environmental, geotechnical, structures and materials, and transportation engineering on the Master of Science and PhD levels.

The Master of Science degree requirements can be completed on a full-time, part-time or cooperative plan basis. Students have the opportunity to select courses from both the day and evening offerings, but an appropriate sequence of courses must be chosen and approved by the Department. It is essential that each student meet with their faculty advisor early in the program so that an appropriate sequence of courses can be arranged.

Master of Science Degree Requirements

A minimum of forty quarter hours of credit including four quarter hours for a Master of Science report or eight quarter hours for a Master of Science thesis with a minimum overall grade point average of 3.0 is required in all programs. With the approval of the department, graduate courses in other departments may be substituted for certain courses. Please refer to the regulations of the Graduate School of Engineering for information on academic and administrative policies.

Students holding a BSCE degree who successfully complete program requirements will receive a Master of Science in Civil Engineering. An unspecified Master of Science degree will be awarded to those students who do not hold a BSCE.

Construction Management

The Construction Management program consists of required core courses primarily from the Civil Engineering Department, complemented by electives from Civil Engineering, the Department of Industrial Engineering and Information Systems, or from the Graduate School of Business Administration. Based on proven proficiency in given areas, certain required core courses can be waived and replaced with alternative courses. In addition to the required core, students choose one or a combination of the following program options: construction and engineering, systems engineering, and/or business management. Each student is required to prepare a program of study which must be reviewed and approved by a faculty advisor during initial registration. Courses taken in other colleges may have different credit hours; degree credit for those courses is granted on a course-for-course equivalency.

Course Requirements	With Report	With Thesis
Required Core Courses.....	27 QH	27 QH
Master of Science Report or Thesis..	4 QH	8 QH
Elective Courses.....	10 QH	6 QH
Minimum Quarter Hours Required*.....	41 QH	41 QH
*exclusive of any preparatory courses		

Required Core Courses	Credits
CIV 3131,3132 Statistics I&II.....	2 each
CIV 3134 Decision Analysis.....	2
CIV 3161 Systems Analysis I.....	2
CIV 3231,3232 Construction Management I & II.....	2 each
CIV 3241,3242 Legal Aspects of Civil Eng'g I & II.....	2 each
CIV 3245 Construction Seminar.....	2
CIV 3250 Project Evaluation and Financing.....	2
CIV 3252 Construction Project Control and Organization.....	2
ACC 3301 Financial Accounting.....	3
IIS 3617 Management Information Systems.....	2
Master of Science Report CIV 3850.....	4
or	
Master of Science Thesis CIV 3860.....	8
<u>Elective Courses:</u>	
Construction and Engineering Emphasis	

CIV 3136 Performance and Safety Evaluation in Civil Engineering.....	2
CIV 3237,3238 Construction Methods and Equipment I and II.....	2 each
CIV 3423(3420,3421) Foundation Engineering I and II.....	4
CIV 3470 Introduction to Structural and Soil Dynamics.....	2
CIV 3572 Selected Topics of Steel Design.....	2
CIV 3520 Engineering Materials.....	2
CIV 3830 Special Topic in Civil Engineering.....	2
CIV 3835 Special Project in Civil Engineering.....	2

Business Management Emphasis (degree credit is granted on a course-for-course equivalency)

ACC 3962 Tax Factors in Business Decisions.....	3
ENT 3968 Management of New Enterprises.....	3
FIN 3760 International Financial Management.....	3
FIN 3770 Small Business Finance.....	3
FIN 3918 Working Capital Management.....	3
HRM 3301 Organizational Behavior.....	3
HRM 3972 Labor Relations.....	3

System Engineering Emphasis (degree credit is granted on a course-for-course equivalency)

CIV 3162 Systems Analysis II.....	2
IIS 3307 Introduction to Microprocessors.....	2
IIS 3308 Microcomputer Applications.....	2
IIS 3600 Basic Computer Systems Technology.....	2
IIS 3614 Basic Information System Technology.....	2
MSC 3805 Operations Management I.....	3
MSC 3913 Operations Management in the Service Sector.....	3
MSC 3928 Decision Support Systems.....	3
MSC 3960 Operations Planning and Control.....	3

Environmental Engineering

The Environmental Engineering Program is currently being revised and it is possible that certain areas of specialization may no longer be offered. Part-time students are urged to see their academic advisors before selecting an area of specialization.

The Graduate Program in Environmental Engineering includes areas of specialization in Water and Wastewater Engineering, Water Resources Engineering, Environmental Health Engineering and Science, and Air Pollution Engineering. With the approval of the faculty advisor, students may take other graduate courses in civil engineering, other engineering disciplines, or in other colleges at Northeastern. Courses carrying four quarter hours of credit meet during the day and are open to students in all environmental engineering programs.

Required Core Courses (2 QH equivalents are in parentheses) Credits

CIV 3312 (3310,3311) Environmental Chemistry I & II.....	4
CIV 3318 (3315,3316) Water & Wastewater Treatment I&II.....	4
CIV 3317 Water and Wastewater Treatment III.....	2
CIV 3320 Environmental Microbiology.....	2
* CIV 3327 (3325,3326) Environmental Analysis I & II.....	4
Master of Science Report CIV 3850.....	4
or	
Master of Science Thesis CIV 3860.....	8

Elective Courses

Selected from any CIV 33XX course listed in this catalog, and also:

CIV 3384 Solid Waste Management.....	2
CIV 3386 Hazardous Waste Practices.....	2
CIV 3830 Special Topics in Civil Engineering.....	2
CIV 3835 Special Project in Civil Engineering.....	2

* Students who select the water resources engineering option are not required to take any of the environmental analysis courses.

Water and Wastewater Engineering

Course Requirements

	<u>With Report</u>	<u>With Thesis</u>
Required Core Courses.....	16 QH	16 QH
Master of Science Report or Thesis..	4 QH	8 QH
Specialty Area Courses.....	10 QH	10 QH
Electives.....	10 QH	6 QH
Minimum Quarter Hours Required*.....	40 QH	40 QH

*exclusive of any preparatory courses

Specialty Area Courses

Credits

CIV 3131 Engineering Statistics.....	2
CIV 3341 Industrial Waste Disposal.....	2
CIV 3343,3344 Unit Operations in Environmental Engineering I & II...2 each	
CIV 3348 Stream Sanitation.....	2

Water Resources Engineering*

*Please note that certain Water Resources Engineering courses are offered in alternate years and it may not be possible to complete this option in one academic year.

<u>Course Requirements</u>	<u>With Report</u>	<u>With Thesis</u>
Required Core Courses.....	12 QH	12 QH
Master of Science Report or Thesis..	4 QH	8 QH
Specialty Area Courses.....	20 QH	16 QH
Electives.....	4 QH	4 QH
Minimum Quarter Hours Required*.....	40 QH	40 QH

*exclusive of any preparatory courses

<u>Specialty Area Courses</u>	<u>Credits</u>
CIV 3131,3132 Engineering Statistics I & II.....	2 each
CIV 3141 Numerical Methods in Civil Engineering.....	2
CIV 3352 Open Channel Flow.....	2
CIV 3355,3356 Hydrology I & II.....	2 each
CIV 3358 Flow Through Porous Media.....	2
CIV 3360 Groundwater and Seepage.....	2
CIV 3367 Water Resources Planning.....	2

Environmental Health Engineering and Science

<u>Course Requirements</u>	<u>With Report</u>	<u>With Thesis</u>
Required Core Courses.....	16 QH	16 QH
Master of Science Report or Thesis..	4 QH	8 QH
Specialty Area Courses.....	10 QH	10 QH
Electives.....	10 QH	6 QH
Minimum Quarter Hours Required*.....	40 QH	40 QH

* exclusive of any preparatory courses

<u>Specialty Area Courses</u>	<u>Credits</u>
CIV 3370 Air Pollution Engineering.....	2
CIV 3372 Air Sampling and Analysis.....	2
CIV 3376 Industrial Hygiene.....	2
CIV 3378 Environmental Planning and Management.....	2
CIV 3380 Environmental Protection.....	2

Air Pollution Engineering

<u>Course Requirements</u>	<u>With Report</u>	<u>With Thesis</u>
Required Core Courses.....	16 QH	16 QH
Master of Science Report or Thesis..	4 QH	8 QH
Specialty Area Courses.....	10 QH	10 QH
Electives.....	10 QH	6 QH
Minimum Quarter Hours Required*.....	40 QH	40 QH

*exclusive of any preparatory courses

<u>Specialty Area Courses</u>	<u>Credits</u>
CIV 3161,3162 Systems Analysis I & II.....	2 each
CIV 3370 Air Pollution Engineering.....	2
CIV 3372 Air Sampling and Analysis.....	2
CIV 3374 Air Pollution Science.....	2

Geotechnical Engineering

The Geotechnical Engineering program includes study in the areas of soil and rock mechanics, foundation engineering, soil dynamics, earthquake engineering, and experimental soil mechanics. With advisor approval, elective courses may be taken from graduate offerings in either engineering or science for which the student has the necessary prerequisites. Each student must meet with his/her academic advisor at the beginning of his/her program to select an appropriate sequence of courses. Courses carrying four quarter hours of credit meet during the day and are open to all students in the geotechnical engineering program.

Course Requirements

	With Report	With Thesis
Required Core Courses.....	18 QH	18 QH
Master of Science Report or Thesis...	4 QH	8 QH
Elective Courses.....	18 QH	14 QH
Minimum Quarter Hours Required*.....	40 QH	40 QH

*exclusive of any preparatory courses

Required Core Course Selections (2 QH equivalents are in parentheses) Credits

CIV 3131	Statistics I.....	2
CIV 3136	Performance and Safety Eval. in Civil Engineering.....	2
CIV 3413 (3410,3411)	Soil Mechanics I & II.....	4
CIV 3412	Stability and Seepage.....	2
CIV 3423 (3420,3421)	Foundation Engineering I & II.....	4
CIV 3470	Introduction to Structural and Soil Dynamics.....	2
CIV 3450	Engineering Geology.....	2
Master of Science Report	CIV 3850.....	4
or		
Master of Science Thesis	CIV 3860.....	8
Elective Courses		
CIV 3132	Statistics II.....	2
CIV 3134	Decision Analysis.....	2
CIV 3141,3142	Numerical Methods in Civil Engineering I & II.....	2 each
CIV 3161	Systems Analysis I.....	2
CIV 3237,3238	Construction Methods and Equipment I & II.....	2 each
CIV 3360	Groundwater and Seepage.....	2
*CIV 3422	Foundation Engineering.....	2
CIV 3430	Soil-Structure Interaction.....	4
CIV 3440	Experimental Soil Mechanics.....	4
CIV 3471	Advanced Soil Dynamics.....	2
CIV 3480	Seismic Design.....	2
CIV 3485	Earthquake Engineering.....	2
CIV 3510,3511	Advanced Structural Mechanics I & II.....	2 each
CIV 3530	Finite Element Analysis of Structures.....	2
CIV 3545	Structural Dynamics.....	4
CIV 3550	Finite Element Procedures in Engineering Analysis.....	4
CIV 3580	Computer-Aided Structural Design.....	4
CIV 3830	Special Topics in Civil Engineering.....	2
CIV 3835	Special Project in Civil Engineering.....	2

*Not acceptable elective for students who take 4QH course CIV 3423.

Structures and Materials

The Structures and Materials core includes courses on analysis of structures, design of structures, and materials. With advisor approval, other elective courses may be taken from any graduate offering in engineering or science for which the student has the necessary prerequisites. Each student must meet with his/her academic advisor at the beginning of the program to select a sequence of courses appropriate to his/her final career goals. Courses carrying four quarter hours of credit meet during the day and are open to all students in the structures and materials program.

<u>Course Requirements</u>	<u>With Report</u>	<u>With Thesis</u>
Required Core Courses.....	28 QH	28 QH
Master of Science Report or Thesis...	4 QH	8 QH
Elective Courses.....	8 QH	4 QH
Minimum Quarter Hours Required*.....	40 QH	40 QH
*exclusive of any preparatory courses		

Required Core Course Selections (2 QH equivalents are in parentheses) Credits		
CIV 3510,3511 Advanced Structural Mechanics I & II.....	2 each	
CIV 3520,3521 Engineering Materials I & II.....	2 each	
CIV 3525 Stability.....	2	
CIV 3530 Finite Element Analysis of Structures.....	2	
CIV 3535 Advanced Structural Analysis.....	4	
CIV 3540 Optimization in Structural Engineering.....	4	
CIV 3545 Structural Dynamics.....	4	
CIV 3550 Finite Element Procedures in Engineering Analysis.....	4	
CIV 3560 Prestressed Concrete.....	2	
CIV 3561 Reinforced Concrete Slabs.....	2	
CIV 3562 Concrete Folded Plates and Shells.....	2	
CIV 3570 Elastic Steel Design.....	2	
CIV 3571 Plastic Steel Design.....	2	
CIV 3572 Selected Topics of Steel Design.....	2	
CIV 3580 Computer Aided Structural Design.....	4	
CIV 3131,3132 Statistics I & II.....	2 each	
CIV 3134 Decision Analysis.....	2	
CIV 3136 Performance and Safety Eval. in Civil Engineering.....	2	
CIV 3141,3142 Numerical Methods in Civil Engineering I & II.....	2 each	
CIV 3161 Systems Analysis I.....	2	
CIV 3412 Stability and Seepage.....	2	
CIV 3413(3410,3411) Soil Mechanics I & II.....	4	
CIV 3423(3420,3421) Foundation Engineering I & II.....	4	
CIV 3422 Foundation Engineering III.....	2	
CIV 3430 Soil-Structure Interaction.....	4	
CIV 3470 Introduction to Structural and Soil Dynamics.....	2	
CIV 3471 Advanced Soil Dynamics.....	2	
CIV 3480 Seismic Design.....	2	
CIV 3485 Earthquake Engineering.....	2	
CIV 3830 Special Topics in Civil Engineering.....	2	
CIV 3835 Special Projects in Civil Engineering.....	2	
Master of Science Report CIV 3850.....	4	
or		
Master of Science Thesis CIV 3860.....	8	
Elective Courses		
Selected from engineering or science.....	4 or 8	

Transportation Engineering

The Transportation Engineering Program is designed for students with career goals in transportation engineering, planning or research. This program may consist of courses from engineering, liberal arts, and/or business. In addition to the degree requirements stated at the beginning of the civil engineering section, students who do not meet a minimum twenty-four quarter hours in civil engineering courses will receive an unspecified Master of Science degree. With advisor approval, a maximum of three courses may be taken in non-technical fields (arts and sciences or business administration). Students should consult the appropriate catalogs for courses outside of engineering. Information on the interdisciplinary program in transportation which leads to a Master of Science in Transportation follows this section.

Course Requirements	With Report	With Thesis
Required Core Courses.....	12 QH	12 QH
Master of Science Report or Thesis... 4 QH	8 QH	
Technical Courses.....	18 QH	14 QH
Non-Technical Courses equivalent to.. 6 QH	6 QH	
Minimum Quarter Hours Required*.....	40 QH	40 QH
*exclusive of any preparatory courses		

Required Core Courses		Credits
CIV 3131,3132 Engineering Statistics I & II.....		2 each
CIV 3161,3162 Systems Analysis I & II.....		2 each
CIV 3640,3641 Theory & Practice of Transportation Planning I & II.....		2 each
Master of Science Report CIV 3850.....		4
or		
Master of Science Thesis CIV 3860.....		8
Technical Courses		
CIV 3134 Decision Analysis.....		2
CIV 3163 Systems Analysis III.....		2
CIV 3610 Urban Public Transportation.....		2
CIV 3630 Traffic Engineering.....		2
CIV 3635 Transportation Engineering.....		2
CIV 3650,3651 Urban Transportation Analysis I & II.....		2 each
CIV 3830 Special Topics in Civil Engineering.....		2
CIV 3835 Special Project in Civil Engineering.....		2
IIS 3514 Advanced Operations Research.....		4
IIS 3503 Simulation Methodology & Applications.....		4
IIS 3512 Queuing Theory & Its Applications.....		2
IIS 3614 Basic Information System Technology.....		2
IIS 3615 Analysis and Design of Computer Information Systems.....		4
Non-Technical Courses (degree credit is granted on a course-for-course equivalency)		
EQN 3363 Urban Economic Systems.....		3
EQN 3364 Urban Economic Development.....		3
EQN 3365 Economics of Urban Transportation		3
EQN 3366 Economics of Inter-City Transportation		3
EQN 3371 Regional Development.....		3
EQN 3379 Development Planning Seminar.....		3
POL 3618 Problems in Urban Planning.....		3
POL 3619 Techniques of Urban Planning.....		3
POL 3623 Transportation Policy.....		3
TRN 3901 Transportation Policy & Regulation.....		3

The Doctor of Philosophy Degree

Award of the Doctor of Philosophy degree is based on exceptional performance in course work and evidence of ability to formulate and execute original research. The degree program has two components: (1) An academic program consisting of a set of graduate level courses which provide depth in a specific area of Civil Engineering (the major field) and additional exposure, at an advanced level, to one or more science disciplines (the minor field); and (2) the doctoral dissertation, an extended independent research effort on a relevant technical problem resulting in an original contribution.

Mastery of the subject matter is measured by a qualifying examination covering a subset of subjects selected from the major field. Research progress is monitored periodically by a Doctoral Dissertation Committee and the candidate is required to present and defend the research results before an expanded group of faculty and research staff at the completion of the work.

The doctoral program is deliberately designed to be flexible with respect to subject area since the PhD degree is primarily a "research" degree and therefore the program must be adaptable to changes in research needs.

Qualifying Examination and Degree Candidacy

The qualifying examination will consist of written and oral portions and its content will depend on the educational background and objectives of the student. In general, the written part will cover subject matter at the Masters level selected from the major field and will include: (1) basic engineering and science disciplines, and (2) civil engineering application areas. The oral portion will measure general comprehension and aptitude for research. If the examination is failed, it may be repeated with permission of the PhD Committee. The qualifying examination must be taken no later than two years after admittance as a doctoral student. Upon successful completion of the examination and satisfaction of the general graduate school regulations, the student is classified as a doctoral candidate. Doctoral study must be completed within five years after classification as a doctoral degree candidate.

Course Requirements

A proposal defining the content of the academic program is developed jointly by the student and faculty advisor, and then reviewed by the PhD Committee. Intellectual rigor, connectivity of subject matter, and compatibility with departmental interests are critical issues. Final approval is arrived at through discussion and represents a mutual agreement between the student and the PhD Committee. Flexibility in program definition is encouraged, especially in areas where complementary courses exist in other departments, or where expertise resides outside the Department and the objective is to introduce new technology in civil engineering practice.

The academic program must contain at least 72 quarter hours of graduate level course work, exclusive of seminars, special study research activities, and MS thesis and PhD dissertation work. A minimum of 60 quarter hours must be related to the major field but can include courses from other departments when appropriate. The minor field must include a minimum of 12 quarter hours of course work in science disciplines of interest to civil engineers, e.g., mathematics, computer science, material science, earth sciences, chemistry, biology, health sciences.

Transfer credit for students entering with a Master of Science Degree will be handled on an individual basis. A minimum of 28 QH of coursework beyond the MS degree must be completed at Northeastern.

Language Requirement

The candidate must be proficient in technical writing and oral presentation in the English language. Appropriate course work may be required by the PhD Committee.

Residence Requirement

Three successive quarters of full-time study on campus are required to establish residence. The total effort for a doctorate involves, as a minimum, three years of full-time work beyond the Bachelor's Degree. Candidates who enter the doctoral program with a Master of Science Degree may complete the requirements in less time, but they should anticipate at least two years of full-time effort.

Dissertation

Once degree candidacy has been established, the student is allowed to proceed with the dissertation effort. The candidate is required to generate a dissertation proposal and identify a civil engineering faculty member who will act as the dissertation advisor. A Dissertation Committee, consisting of the dissertation advisor and at least four other Northeastern faculty members, selected by the PhD Committee, will monitor progress and approve the final document.

Comprehensive Examination

The comprehensive examination consists of a defense of the doctoral research work and an examination of subject matter related to the dissertation area.

Faculty
Mishac K. Yegian, Chairman

Professors

Amory, Reginald L., PE, PhD, Rensselaer Polytechnic Institute; advanced structural mechanics, structural stability, finite element analysis, complex steel structures, inelastic and viscoelastic behavior of materials
Blanc, Frederic C., PE, PhD, New York University; wastewater; industrial, hazard, and solid waste

Cochrane, John J., PE, PhD, Rensselaer Polytechnic Institute; treatment process design, computer-aided analysis and design, water quality management

Gregory, Constantine J., PhD, Rutgers University; air pollution control, environmental modeling, industrial hygiene

Leet, Kenneth M., PE, ScD, Massachusetts Institute of Technology; design and behavior of reinforced and prestressed concrete structures, high strength concrete, durability of concrete

Yegian, Mishac K., PE, PhD, Massachusetts Institute of Technology; soil dynamics, earthquake engineering, risk analysis

Associate Professors

Cahoon, Leroy M., PE, MS, Northeastern University; structural design, design and behavior of steel structures

Cohen, Menashi D., PhD, Stanford University; physico-chemical, microstructural, and macrostructural properties of materials, nondestructive evaluation of materials characteristics

Jaworski, Walter E., PE, PhD, Massachusetts Institute of Technology; earth structures, foundation engineering

Kupferman, Michael, PE, PhD, University of Massachusetts; engineering geology, geotechnology

Meserve, Robert L., PE, MS, Northeastern University; water and wastewater treatment, hydraulics, highways, surveying, environmental design

Schoon, John G., PE, PhD, Polytechnic Institute of New York; transportation analysis and planning, traffic engineering, highways and public works

Scranton, Richard J., MS, Massachusetts Institute of Technology; transportation systems, mechanics, applied probability

Wei, Irvine W., PhD, Harvard University; water chemistry, treatment processes, acid precipitation

Assistant Professors

Bernal, P. Dionisio, PhD, University of Tennessee; earthquake engineering, structural engineering

Furth, Peter G., PhD, Massachusetts Institute of Technology; transportation analysis and planning

Karaa, Fadi A., PhD, Massachusetts Institute of Technology; construction management

Marciano, Eugene A., PhD, Purdue University; geotechnical engineering, soil dynamics, earthquake engineering, reliability analysis

Advisors

	<u>Part-time</u>	<u>Full-time</u>
Construction	(A-Z) Prof. Kara	(A-Z) Prof. Kara
Environmental	(A-C) Prof. Gregory (D-G) Prof. Blanc (H-L) Prof. Cochrane (M-R) Prof. Meserve (S-Z) Prof. Wei	(A-Z) Prof. Blanc
Geotechnical	(A-L) Prof. Jaworski (M-Z) Prof. Marciano	(A-L) Prof. Jaworski (M-Z) Prof. Marciano
Structural	(A-L) Prof. Amory (M-Z) Prof. Cahoon	(A-Z) Prof. Leet
Transportation	(A-L) Prof. Schoon (M-Z) Prof. Furth	(A-L) Prof. Schoon (M-Z) Prof. Furth

CIVIL ENGINEERING

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time.

CIV 3131 Engineering Statistics I (2QH)

(formerly 01.916)

Fall Quarter

The basic elements of probability theory and statistics and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, transportation. Probability of events, random variables and distributions, derived distributions, expectation, common probability models. Prep. Undergraduate calculus.

CIV 3132 Engineering Statistics II (2QH)

(formerly 01.917)

Winter Quarter

Continuation of CIV 3131. Includes parameter estimation, confidence intervals, hypothesis testing, and linear statistical models. Prep. CIV 3131.

CIV 3134 Decision Analysis in Civil Engineering (2QH)

Spring Quarter

Basic theory of decision-making under uncertainty, applied to design and managerial problems in civil engineering, feasibility analysis and construction (e.g. reservoir capacity design, dam safety options, to build or not to build a drainage system, flood levee design, economic analysis of construction projects, value engineering, construction method selection in tunneling). Decision trees, value of perfect information and value of sample information. Multi-criteria decision making and multi-attribute utility theory. Prep. CIV 3131

CIV 3136 Performance and Safety Evaluation in Civil Engineering (2QH)

Spring Quarter

Application of reliability to the design and analysis of civil engineering facilities. The reliability of redundant systems such as indeterminate structures. Statistical distributions of system parameters (e.g. component strengths, flow rates, soil strengths) and demands (e.g. seismic loading, traffic volumes). Safety indices, load factors, and reliability based design codes. Damage evaluation and reliability prediction of civil engineering facilities. Prep. CIV 3131

CIV 3141 Numerical Methods in Civil Engineering I (2QH)

(formerly 01.888)

Fall Quarter, Alternate Years

Introduction, errors in numerical analysis. Solution of nonlinear algebraic equations. Solution of large systems of linear algebraic equations by direct and iterative methods. Introduction to matrix eigenvalue problems. Examples are drawn from structural mechanics. Prep. Admission to the Graduate School of Engineering.

CIV 3142 Numerical Methods in Civil Engineering II (2QH)

(formerly 01.889)

Winter Quarter, Alternate Years

Continuation of CIV 3141. Approximation of functions: interpolation, and least squares curve fitting; orthogonal polynomials. Numerical differentiation and integration. Solution of ordinary and partial differential equations, and integral equations; discrete methods of solution of initial and boundary-value problems. Examples are drawn from structural mechanics, geotechnical engineering, hydrology and hydraulics. Prep. CIV 3141.

CIV 3161 Systems Analysis I (2QH)

(formerly 01.807)

Fall Quarter

Application of linear optimization models to various civil engineering problems: the simplex method, sensitivity analysis, transportation problem, transshipment problem, shortest path problem. Prep. Admission to Graduate School of Engineering.

CIV 3162 Systems Analysis II (2QH)

(formerly 01.808)

Winter Quarter

Further application of systems analysis techniques to civil engineering problems: dynamic programming, linear regression, model estimation, queueing theory, project evaluation. Prep. CIV 3161 and CIV 3131; to be taken concurrently with CIV 3132.

CIV 3163 Systems Analysis III (2QH)

(formerly 01.809)

Spring Quarter

Further application of techniques and approaches presented in CIV 3161 and CIV 3162. New topics to be presented include integer programming, nonlinear programming, simulation, decision analysis. Other topics may be added according to interest, as time allows. Aim will be to help prepare students to complete a term project employing numerous techniques of systems analysis. Prep. CIV 3162.

CIV 3171 Seminar in Public Works I (2QH)

Winter Quarter

History and role of Public Works in development (topics include historical development, economic and financial dimensions of public works in city and state government, technological change, local, regional and national planning); Public Works capital development (topics include political, economic, financial, social, administrative and technical factors). Prep. Admission to Graduate School of Engineering

CIV 3172 Seminar in Public Works II (2QH)

Spring Quarter

Public Works applications in management science (topics include applications of benefit/cost, cost-effectiveness, allocation models, decision theory, queueing theory, simulation, etc.); Maintenance management (topics include inventory, performance standards, scheduling, budgets and finance); Public Works planning issues (topics include environmental assessment, techniques of land use planning and procedures, facility location and resource utilization. Prep CIV 3171

CIV 3231 Construction Management I (2QH)

(formerly 01.821)

Fall Quarter

This course treats cost estimating, including a description of computerized cost estimating systems; duration estimating, considering work analysis techniques; value engineering as a concept and its effect on the construction industry; and specifications, including the use and importance of computerized Specification Writing Systems. Prep. Admission to Graduate School of Engineering.

CIV 3232 Construction Management II (2QH)

(formerly 01.822)

Winter Quarter

This course contains treatment of the application of scheduling methods to the control of construction activities including resource allocation, quality control, cash flow progress reporting, and the effects of change orders. Prep. CIV 3231.

CIV 3237 Construction Methods and Equipment I (2QH)

(formerly 01.830)

Fall Quarter

This course treats typical approaches to construction in a selection of application areas such as steel and concrete structures, hydraulic and port facilities, horizontal construction and the like. Prep. Admission to Graduate School of Engineering.

CIV 3238 Construction Methods and Equipment II (2QH)

(formerly 01.831)

Winter Quarter

This course is a continuation of CIV 3237, treating additional areas of construction. Prep. CIV 3237.

CIV 3241 Legal Aspects of Civil Engineering I (2QH)

(formerly 01.832)

Fall Quarter

A presentation of U.S. and International legal systems and theories necessary for the comprehension of business and contractual liabilities, rights and obligations in the engineering field. Prep. Admission to the Graduate School of Engineering.

CIV 3242 Legal Aspects of Civil Engineering II (2QH)

(formerly 01.833)

Winter Quarter

This course deals with the description and evaluation of various types of construction contracts, procedures and formats for submitting bids, filing claims, and legal steps to avoid liabilities, utilizing the principles learned in CIV 3241. Prep. CIV 3241.

CIV 3245 Construction Seminar (2QH)

(formerly 01.827)

Spring Quarter

This course is a reading and discussion course centering on recent research publications in Construction Engineering. Prep. Limited to Construction Management Program majors; to be taken in Final Spring Quarter.

CIV 3250 Project Evaluation and Financing (2QH)

Fall Quarter

Review of project evaluation techniques, as applied to construction and infrastructure projects. Bond pricing mortgage analysis. Construction loan analysis in the development process. Valuation of income-producing properties. Project financing packages in the areas of real property and infrastructure. Impact of financing on project value. Capital Budgeting Models and their applications to infrastructure planning. Prep. Concurrent with ACC 3811

CIV 3252 Construction Project Control and Organization (2QH)

Winter Quarter

Organization of construction firms, both at the general corporate level and at the project level. Organization dynamics designed to respond to the requirements of the environment given the internal constraints of the firm. Computer systems for the control of construction projects. Design attributes to fit the needs of the organization and the end users. Estimating, scheduling, budgeting and financial control of projects. Network-based systems for planning and time control. Intra-project and inter-project resource allocation. Data-base design concepts for decision support systems. Prep. CIV 3161

CIV 3310 Environmental Chemistry I (2QH)

(formerly 01.920)

Fall Quarter

A review of basic chemistry is followed by a discussion of the equilibrium chemistry of homogeneous and heterogeneous systems with applications in environmental engineering. The physical and chemical properties of water are studied, as are acidity, alkalinity, hardness, and water softening. Topics in receiving water quality and disinfection are included. Prep. Two quarters of general chemistry.

CIV 3311 Environmental Chemistry II (2QH)

(formerly 01.921)

Winter Quarter

A continuation of CIV 3310, including the basic principles of chemical thermodynamics, electrochemistry, kinetics, organic chemistry, biochemistry, and nuclear chemistry as they relate to environmental engineering. Colloidal chemistry and coagulation are discussed as are fundamental water quality parameters such as BOD, COD, and TOC. Prep. CIV 3310; to be taken concurrently with CIV 3325.

CIV 3312 Environmental Chemistry I and II (4QH)

(formerly 01.923)

Fall Quarter

This course embodies the material in CIV 3310 and CIV 3311. Prep. Two quarters of general chemistry.

CIV 3315 Water and Wastewater Treatment I (2QH)

(formerly 01.910)

Fall Quarter

Water quality, water impurities and effects, the theory and practice of water treatment, and the elements of design of water treatment works including intake facilities, wells, coagulation, sedimentation, filtration, softening, iron and manganese removal, disinfection and fluoridation. Prep. Undergraduate fluid mechanics and CIV 3311.

CIV 3316 Water and Wastewater Treatment II (2QH)

(formerly 01.911)

Winter Quarter

Waste characteristics, the theory and practice of wastewater treatment and disposal, and the elements of design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological treatment processes, sludge digestion and disposal, stabilization ponds, and disinfection. Prep. CIV 3315.

CIV 3317 Water and Wastewater Treatment III (2QH)

(formerly 01.912)

Winter and Spring Quarters

Desalination, advanced wastewater treatment, land treatment, effluent disposal and reuse, small alternative wastewater systems, and other special problems in water and wastewater characteristics and treatment, including corrosion control, and application and storage of chemicals. Prep. CIV 3316 or CIV 3318.

CIV 3318 Water and Wastewater Treatment I and II (4QH)

(formerly 01.914)

Fall Quarter

This course embodies the material in CIV 3315 and CIV 3316. Prep. Undergraduate fluid mechanics; to be taken concurrently with CIV 3312.

CIV 3320 Environmental Microbiology (2QH)

(formerly 01.922)

Winter and Spring Quarters

A study of microbiology with emphasis on environmental engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction, and metabolism of microorganisms of environmental significance. Effects of environmental factors including inhibition, killing, and natural habitats are discussed. In addition, anaerobic digestion and eutrophication are covered. Prep. CIV 3311; to be taken concurrently with CIV 3326.

CIV 3325 Environmental Analysis I (2QH)

(formerly 01.930)

Winter Quarter

A laboratory course for the analytical evaluation of environmental conditions. Included are coagulation studies, chlorine demand determination, and the use of colorimetric spectroscopy. Interpretation of analytical results for practical applications is also stressed. Prep CIV 3310; to be taken concurrently with CIV 3311.

CIV 3326 Environmental Analysis II (2QH)

(formerly 01.931)

Spring Quarter

Laboratory analyses are continued with emphasis on the chemical and biological analyses associated with wastewater treatment methods. Nitrogen determinations are included. Gas chromatography and atomic absorption spectroscopy are used for trace analyses of organics and metals. Prep. CIV 3325; to be taken concurrently with CIV 3320.

CIV 3327 Environmental Analysis I and II (4QH)

(formerly 01.933)

Fall Quarter

This course embodies the material in CIV 3325 and CIV 3326. Prep. to be taken concurrently with CIV 3312.

CIV 3341 Industrial Waste Disposal (2QH)

(formerly 01.913)

Spring Quarter

Evaluation of industrial waste problems and development of process design for the required treatment facilities; study of various manufacturing processes and their wastewater problems; industrial waste survey techniques; characteristics of industrial wastes; evaluation of hazardous materials; waste reduction methods; physical, chemical, biological and advanced treatment methods; industrial wastewaters and disposal and treatment of industrial solids and liquids. Prep. CIV 3311 and CIV 3317.

CIV 3343 Unit Operations in Environmental Engineering I (2QH)

(formerly 01.935)

Winter Quarter

Laboratory scale unit operations illustrating the physical, chemical and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. Prep. CIV 3317 and CIV 3326.

CIV 3344 Unit Operations in Environmental Engineering II (2QH)
(formerly 01.936)

Spring Quarter

A continuation of CIV 3343. Topics include biodegradability studies using activated sludge, fixed-film reactors, anaerobic digestion, vacuum filtration, and chemical-physical processes involved in wastewater treatment. A comprehensive evaluation of each unit process is required in a report from each student. Prep. CIV 3343.

CIV 3348 Stream Sanitation (2QH)
(formerly 01.954)

Winter Quarter

Analysis of the fate and effects of discharge of conservative and non-conservative pollutants in surface receiving waters and groundwaters. Topics include BOD and oxygen relationships in streams, eutrophication and general water quality improvement techniques. Prep CIV 3310.

CIV 3352 Open Channel Flow (2QH)
(formerly 01.903)

Winter Quarter

Rapidly varied flow, hydraulic jump and its applications; flow through nonprismatic channel sections; flow in channels of nonlinear alignment, wave action; unsteady flow, dynamic equations; wave propagation; flood routing in rivers.

CIV 3355 Hydrology I (2QH)
(formerly 01.908)

Winter Quarter, Alternate Years

Elements of the hydrologic cycle, precipitation, evaporation, streamflow, groundwater; water balance equation for watersheds; streamflow hydrographs, unit hydrographs, hydrographs of overland flow; relation between precipitation and runoff; hydrologic and hydraulic routings, linear reservoirs routing. Prep. CIV 3131 and undergraduate fluid mechanics and hydraulic engineering.

CIV 3356 Hydrology II (2QH)
(formerly 01.909)

Spring Quarter, Alternate Years

Deterministic hydrologic models; probability in hydrology; stochastic hydrology, generation of data, Markov chain series; flood forecasting; applications of hydrology and design considerations. Prep. CIV 3132 and CIV 3355.

CIV 3358 Flow Through Porous Media (2QH)
(formerly 01.924)

Fall Quarter, Alternate Years

Groundwater uses; properties of porous media; infiltration, saturated and unsaturated zones, soil water interactions; types of aquifers; Darcy's law, Dupuit-Forchheimer's assumption, groundwater flow equations, steady and unsteady cases; steady state seepage problems, method of flow nets; dispersion of groundwater, quality and contamination of groundwater. Prep. Undergraduate fluid mechanics and hydraulic engineering.

CIV 3360 Groundwater and Seepage (2QH)
(formerly 01.925)

Winter Quarter, Alternate Years

Hydraulics of wells, steady and transient flow equations, pumping tests, multiple well systems, methods of images; superposition, leaky aquifers, salt-water intrusion, static equilibrium and hydrodynamic equilibrium, control of saline water intrusion; numerical and experimental methods, physical models, analog models, finite difference solution, introduction to the method of finite elements. Prep. CIV 3358.

CIV 3367 Water Resources Planning (2QH)
(formerly 01.965)

Spring Quarter, Alternate Years

The nature of water resources projects (socio-political, legal); water resources planning objectives (economic, cost, benefit); problems in water resources engineering (development, design, operational, recapitulation); introduction to linear and dynamic programming; simulation methods; Case studies. Prep. CIV 3141 and CIV 3355.

CIV 3370 Air Pollution Engineering (2QH)

(formerly 01.950)

Winter Quarter

Theory and practice related to engineering management of air resources; applications of models for the atmospheric dispersion of pollutants; analysis of control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discussion of source control evaluation and air quality standards. Course CIV 3374 is recommended. Prep. Admission to Graduate School.

CIV 3372 Air Sampling and Analysis (2QH)

(formerly 01.955)

Spring Quarter, Alternate Years

A laboratory course on air pollution measurements utilizing physical, chemical and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitative measurements of pollutants are performed utilizing microscopy, spectrophotometry, gas chromatography, and atomic absorption spectroscopy. Prep. CIV 3370.

CIV 3374 Air Pollution Science (2QH)

(formerly 01.957)

Fall Quarter

Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. Note: This course is open to non-engineering as well as to engineering graduate students. Prep. Consent of the department and instructor.

CIV 3376 Industrial Hygiene (2QH)

(formerly 01.952)

Winter Quarter

Characterization and control of industrial problems associated with noise, heat and ventilation. Physical and biological aspects of environmental stress are discussed. Emphasis is placed on the application of engineering principles to the design of control systems. Evaluation procedures for control effectiveness are reviewed. Prep. Admission to Graduate School of Engineering.

CIV 3378 Environmental Planning and Management (2QH)

(formerly 01.980)

Fall Quarter

Planning and operation, and management of specific environmental systems, such as collection systems; solids separators, combined systems control, sewer flushing, deposition loadings with least squared applications, and case studies in optimal design of treatment plants with variable input. Prep. Admission to Graduate School of Engineering.

CIV 3380 Environmental Protection (2QH)

(formerly 01.985)

Spring Quarter, Alternate Years

Environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems and renewable resources; interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. Prep. Admission to Graduate School of Engineering.

CIV 3384 Solid Waste Management (2QH)

(formerly 01.945)

Fall Quarter

Basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices and reclamation possibilities. Prep. Admission to Graduate School of Engineering.

CIV 3386 Hazardous Waste Practices (2QH)

(formerly 01.946)

Spring Quarter

An investigation of hazardous waste management practices including: identification, storage, transport, treatment processes, incineration, recycling, reuse, chemical landfills and ground-water contamination. Prep. CIV 3311 or CIV 3312.

CIV 3410 Soil Mechanics I (2QH)

(formerly 01.871)

Fall Quarter

Phase relationships and index properties, permeability, capillarity, effective stress concept, porous media flow, stress distribution, stress path concept, 1-D settlement analysis. Prep. Undergraduate course in soil mechanics.

CIV 3411 Soil Mechanics II (2QH)

(formerly 01.872)

Winter Quarter

Continuation of CIV 3410. Consolidation theory, 3-D settlement analysis, shear strength properties of soils, stress path analysis. Prep. CIV 3410.

CIV 3412 Stability and Seepage (2QH)

formerly 01.873)

Spring Quarter

A continuation of CIV 3411. Stability of open cuts and natural slopes; numerical analysis and computer applications to stability, seepage, consolidation, and deformation problems, laboratory testing; field instrumentation; special topics. Prep. CIV 3411 or CIV 3413

CIV 3413 Soil Mechanics I and II (4QH)

(formerly 01.877)

Fall Quarter

Embodies the material in CIV 3410 and CIV 3411. Prep. Undergraduate course in soil mechanics.

CIV 3420 Foundation Engineering I (2QH)

(formerly 01.874)

Fall Quarter, Alternate Years

Lateral earth pressure theory; retaining wall design; anchored bulkheads; braced cofferdams, dewatering, observational approach to design. Prep. CIV 3411 or CIV 3413.

CIV 3421 Foundation Engineering II (2QH)

(formerly 01.875)

Winter Quarter, Alternate Years

Bearing capacity, design of shallow foundations, site improvement (preloading, deep densification), case studies of foundation performance. Prep. CIV 3420.

CIV 3422 Foundation Engineering III (2QH)

(formerly 01.876)

Spring Quarter, Alternate Years

Pile foundations, caissons, selection of foundation scheme; case studies. Prep. CIV 3421.

CIV 3423 Foundation Engineering I and II (4QH)

(formerly 01.878)

Spring Quarter

Embodies the course content offered in CIV 3420 and CIV 3421. Prep. CIV 3411 or CIV 3413.

CIV 3430 Soil-Structure Interaction (4QH)

(formerly 01.870)

Winter Quarter, Alternate Years

Introduction to pile foundations; beam on elastic foundations; deformations of axially and laterally loaded single piles and pile groups using available computer software; pile load tests; case histories. Prep. CIV 3411 or CIV 3413.

CIV 3440 Experimental Soil Mechanics (4QH)

(formerly 01.879)

Spring Quarter, Alternate Years

Laboratory evaluation of engineering properties of soils with emphasis on permeability, compressibility and strength. Introduction to model analysis of static and dynamic behavior of soils. Prep. CIV 3411 or CIV 3413.

CIV 3450 Engineering Geology (2QH)

(formerly 01.882)

Winter Quarter

Selected topics in historical and structural geology related to engineering geology; origin and occurrence of various rock types, geologic structures, faulting and joint systems; weathering of rock and weathering products, glaciation, geologic mapping and environmental aspects; case studies. Prep. Undergraduate course in geology.

CIV 3470 Introduction to Structural and Soil Dynamics (2QH)

(formerly 01.886)

Fall Quarter

Dynamic response analysis of one-degree-of-freedom systems, characteristics of earthquakes and resulting ground motions, response spectra, stress-strain behavior of soils during dynamic and repeated loading, laboratory and field determinations, wave propagation through elastic media, effect of local soil condition upon earthquake ground motions. Prep. Admission to the Geotechnical Engineering Program.

CIV 3471 Advanced Soil Dynamics (2QH)

(formerly 01.887)

Winter Quarter

Dynamic response analysis of a single mass, multi-degree-of-freedom systems; machine foundation design and analysis; soil-structure interaction, ground vibrations, sources and control; shear strength during repeated loading, liquefaction; dynamic analysis of retaining structures and slopes. Prep. CIV 3470.

CIV 3480 Seismic Design (2QH)

(formerly 01.850)

Spring Quarter

Earthquake considerations in building design process, dynamic analysis of multi-degree-of-freedom elastic systems subjected to earthquake motions and cyclically applied forces, inelastic dynamic response analysis. Seismic provisions of building codes; soil-structure interaction. Prep. CIV 3470.

CIV 3485 Earthquake Engineering (2QH)

(formerly 01.851)

Spring Quarter, Alternate Years

Seismic hazard and seismic risk analysis; seismic design decision analysis; lifeline earthquake engineering; pipelines, liquid storage tanks, water distribution systems; earthquake analysis of earth dams and slopes; dynamic analysis of retaining walls and offshore facilities; dynamically loaded piles. Prep. CIV 3470.

CIV 3510 Advanced Structural Mechanics I (2QH)

(formerly 01.841)

Fall Quarter

Analysis of force equilibrium (stress), deformation/displacement (strain), and force/deformation (Hooke's Law) for an elastic solid; compatibility; governing equations for complete and approximate elasticity solution. Plane stress solution for narrow rectangular beams. Torsion, Saint Venant's theory, membrane analogy, rectangular sections, thin open and closed sections. Introduction to bending of thin plates. Prep. Undergraduate structural mechanics and structural analysis.

CIV 3511 Advanced Structural Mechanics II (2QH)

(formerly 01.842)

Winter Quarter

Consistent models for the mechanics of simple structural elements: axial, bending, plane stress, and the like. Equilibrium, geometry of deformation, and force/deformation as the governing relations of all structural elements. Work and energy principles: virtual displacement, virtual forces, minimum potential energy, minimum complementary energy, introduction to variational ideas, Rayleigh-Ritz method. Prep. CIV 3510.

CIV 3520 Engineering Materials I (2QH)

(formerly 01.824)

Winter Quarter

Mechanical, microstructural, physical and chemical properties of cements and concretes and their roles in structures, pavements, bridge-decks, repair and rehabilitation will be covered. Different concretes such as expansive cement concrete, sulfate-resistant concrete, sulfur concrete and fiber-reinforced concrete will be introduced. Prep. Admission to Graduate School.

CIV 3521 Engineering Materials II (2QH)

(formerly 01.825)

Spring Quarter, Alternate Years

Topics include the elastic, plastic and viscoelastic properties of solids and composites; introduction to fracture mechanics and fatigue. Prep. Admission to Graduate School.

CIV 3525 Stability (2QH)

(formerly 01.859)

Spring Quarter

Prediction of the buckling loads in columns, behavior of beam-columns, use of numerical methods to compute the buckling loads of nonprismatic members, buckling of plates. Prep. CIV 3510 and CIV 3511.

CIV 3530 Finite Element Analysis of Structures (2QH)

(formerly 01.843)

Spring Quarter

Introduction to finite-element method for structural analysis. Overview of direct stiffness method. Formulation of element stiffness matrices by direct use of elasticity relations and by energy methods for simple elements; axial, bending, plane stress, and plane strain; transformation of coordinate systems; lumping work equivalent loads; bounds on the error solution. Plate bending. Use of finite-element computer programs. Prep. CIV 3511.

CIV 3535 Advanced Structural Analysis (4QH)

(formerly 01.845)

Winter Quarter

Offered days. Formulation and solution of structural problems with primary application to member systems (trusses, frames, curved members), matrix formulation of flexibility and stiffness methods; geometrically nonlinear behavior. Prep. Admission to the Graduate School of Engineering.

CIV 3540 Optimization in Structural Engineering (4QH)

(formerly 01.852)

Spring Quarter

Unconstrained and constrained optimization; Kuhn-Tucker condition: Sequential Unconstrained Minimization Technique (SUMT); design sensitivity analysis; Gradient Projection Method (GRP). Although problem formulation is quite general, emphasis will be on the practical structural application where the displacement (stiffness) method is used as part of the structural-synthesis algorithm. Prep. CIV 3535.

CIV 3545 Structural Dynamics (4QH)

(formerly 01.857)

Fall Quarter

Single degree of freedom structural systems, free vibration, forced vibration, Duhamel integral time step integration, multi-degree of freedom structural systems, model analysis, damping, response spectra, nonlinear systems, earthquake ground motions. Prep. concurrently with CIV 3535.

CIV 3550 Finite Element Procedures in Engineering Analysis (4QH)

(formerly 01.890)

Winter Quarter

Finite elements and finite difference methods for analysis of linear and nonlinear problems in solid, structural, and fluid mechanics. Computer-based numerical solutions in statics and dynamics (model analysis and direct integration). Eigensolution algorithms. Applications: forced vibration analysis, earthquakes, offshore, structural analysis. Prep. CIV 3535 and CIV 3545.

CIV 3560 Prestressed Concrete (2QH)

(formerly 01.853)

Fall Quarter

Fundamentals of prestressing; design of prestressed concrete beams for flexure and shear; design of end blocks; load balancing method for the analysis of indeterminate prestressed structures; column design. Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.

CIV 3561 Reinforced Concrete Slabs (2QH)

(formerly 01.854)

Fall Quarter

Design of two-way slabs by the equivalent frame method; yield line theory; prestressing of slabs; the strip method; and introduction to folded plate design. Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.

CIV 3562 Concrete Folded Plates and Shells (2QH)

(formerly 01.855)

Spring Quarter, Alternate Years

Additional topics of folded plate design, design of thin shelled structures including hyperbolic paraboloids and shells of revolution. Prep. CIV 3561.

CIV 3570 Elastic Steel Design (2QH)

(formerly 01.861)

Fall Quarter

An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind and seismic loads are considered. Prep. Undergraduate Steel Design and Structural Analysis.

CIV 3571 Plastic Steel Design (2QH)

(formerly 01.862)

Winter Quarter

An advanced course in analysis and design in structural steel with emphasis on plastic behavior including rigid frame buildings and braced multistory frame buildings. Prep. Undergraduate Steel Design and Structural Analysis.

CIV 3572 Selected Topics of Steel Design (2QH)

(formerly 01.863)

Spring Quarter, Alternate Years

Advanced problems in elastic and plastic design of structural steel. Topics include curved girders, cable supported structures, fatigue considerations, and composite sections with steel deck. Prep. Undergraduate Steel Design and Structural Analysis.

CIV 3580 Computer-Aided Structural Design (4QH)

(formerly 01.848)

Fall Quarter

General characteristics of computer aided design software, development of software for the solution of typical structural steel and reinforced concrete design problems. Prep. CIV 3535.

CIV 3610 Urban Public Transportation (2QH)

(formerly 01.811)

Fall Quarter, Alternate Years

Analysis and planning of public transportation systems, including bus, subway, commuter rail, and paratransit; performance prediction; service evaluation and efficiency control measure; demand prediction; institutional and economic issues. Prep. Admission to Graduate School.

CIV 3630 Traffic Engineering (2QH)

(formerly 01.817)

Spring Quarter

Measurement of traffic characteristics and system performance; theory of traffic flow and analytical techniques; systems hardware design and evaluation; current concerns of energy, environmental, and urban amenity impacts; computer applications and institutional characteristics. Prep. Admission to Graduate School.

CIV 3635 Transportation Engineering (2QH)

(formerly 01.820)

Winter Quarter, Alternate Years

Description and evaluation of different modes of transportation existing and proposed; their performance and cost characteristics; design, performance, and selection criteria for vehicles and roadbeds. Prep. Admission to Graduate School.

CIV 3640 Theory and Practice of Transportation Planning I (2QH)

(formerly 01.835)

Fall Quarter

Establishments of goals, objectives and criteria; the current planning framework; examination of performance characteristics of transportation systems, including public and private modes on land, water, and airways. Prep. Admission to Graduate School.

CIV 3641 Theory and Practice of Transportation Planning II (2QH)

(formerly 01.836)

Fall Quarter

Continuation of CIV 3640. Transportation demand modeling from regional economic analysis to traffic and public transportation network assignment; technical and economic evaluation; current issues, including environmental assessment, transportation systems management, citizen participation, and planning in developing countries. Prep. CIV 3640 to be taken previously or concurrently.

- CIV 3650 Urban Transportation Analysis I (2QH)
(formerly 01.815) Winter Quarter, Alternate Years
Principles of analysis of urban transportation systems including travel demand equilibrium, performance and evaluation techniques using aggregate and disaggregate methods. Prep. CIV 3641 and appropriate graduate statistics courses.
- CIV 3651 Urban Transportation Analysis II (2QH)
(formerly 01.816) Spring Quarter, Alternate Years
Continuation of CIV 3650. Conceptualization, formulation, application, and evaluation of mathematical models utilized in urban transportation systems analysis; case studies of representative analyses. The objective of this course is to help prepare students to conceptualize, formulate, apply and evaluate appropriate mathematical modeling techniques in transportation. Prep. CIV 3650.
- CIV 3798 Master's Thesis Continuation (0QH)
(formerly 01.9X1) Any Quarter
- CIV 3799 PhD Continuation (0QH)
(formerly 01.9X4) Any Quarter
- CIV 3830 Special Topic in Civil Engineering (2QH)
(formerly 01.992) Fall, Winter, Spring Quarters
Topics of interest to the staff member conducting this course is presented for advanced study. The course is initiated by the appropriate discipline committee and approved by the Department. Prep. Consent of the instructor.
- CIV 3835 Special Project in Civil Engineering (2QH)
(formerly 01.995) Any Quarter
An individual effort in an area selected by student and advisor and approved by the Departmental Discipline Committee resulting in a definitive report. Prep. Permission of the Department.
- CIV 3850 Master's Report (4QH)
(formerly 01.993) Any Quarter
An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of civil engineering selected by student and advisor resulting in a definitive report. The report must be completed 7 years from the start of the Master's program. Prep. Permission of the Civil Engineering Department.
- CIV 3851 Master's Report (2QH) Any Quarter
- CIV 3860 Master's Thesis (8QH)
(formerly 01.991) Any Quarter
Analytical and/or experimental research conducted by arrangement with and under the supervision of the department. Prep. Permission of the Civil Engineering Department.
- CIV 3861 Master's Thesis (4QH) Any Quarter
- CIV 3862 Master's Thesis (2QH) Any Quarter
- CIV 3880 PhD Thesis (0QH)
(formerly 01.997) Any Quarter
Open to full-time Doctoral students only. Prep. Admission to doctoral program in Civil Engineering.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

The Department of Electrical and Computer Engineering offers graduate programs leading to the degrees of Master of Science in Electrical Engineering, Master of Science (no specification), Electrical Engineer, and Doctor of Philosophy in Electrical Engineering. The Master of Science degree program may be completed on either a part-time, a continuous full-time, or a cooperative full-time basis. The Electrical Engineer and the PhD degree programs must be completed on a basis consistent with the residence requirements for the degree. The curriculum offers areas of concentration in computer engineering; communications and signal processing; control systems and signal processing; power systems; electronic circuits and semiconductor devices; and fields, waves and optics.

Students in the Industrial Fellowship or Women in Engineering Programs follow the same degree requirements in their subject areas required of all graduate students. Courses offered in the day typically carry four quarter hours of credit; their two-quarter-hour equivalents are given in the evening over two academic quarters. Each full-time student is responsible for meeting with his or her faculty advisor early in the program so that an appropriate sequence of courses can be arranged. Part-time students should follow the prescribed requirements and confer with their faculty advisor as needed.

Master of Science Degree Requirements

A minimum of forty-four quarter hours of graduate courses with a minimum grade point average of 3.0 is required in all programs. Full-time students are required to complete either an eight quarter hour Master of Science thesis or a four quarter hour seminar as part of their program. Industrial Fellowship students must complete the eight quarter hour Master of Science thesis. Master of Science thesis or seminar are optional for part-time students. For students selecting the thesis option, an Examination Committee shall be formed consisting of the student's major advisor and two full-time faculty members (or one full-time faculty member and one advisor from industry) with background relevant to the thesis topic. The thesis shall be presented by the student to the Committee and to the ECE Department-at-large in the form of a seminar presentation before final approval of the thesis is granted. Please refer to the regulations of the Graduate School of Engineering for detailed information on academic and administrative policies.

Students holding a BSEE degree from an ABET accredited institution will qualify for the Master of Science in Electrical Engineering. An unspecified Master of Science degree will be awarded to those students who do not hold a BSEE.

All graduate courses presuppose mastery of the subject matter of a modern ABET accredited curriculum in electrical engineering. Students with a Bachelor of Science degree in other engineering or related science fields and students with a BSEE degree who have not taken graduate academic work for some time may be required to take one or more of the following undergraduate level prerequisite courses to satisfy any deficiencies. These courses carry no credit toward the graduate degree.

<u>Prerequisite Courses</u>	<u>Credits</u>
ECE 3100 Introduction to Circuits and Systems.....	4
ECE 3101 Introduction to Electronics.....	4
ECE 3102 Introduction to Electromagnetic Field Theory.....	4
ECE 3103 Introduction to Digital Computers.....	4
ECE 3104 Introduction to Communications.....	4
ECE 3105 Introduction to System Software I.....	2
ECE 3106 Introduction to System Software II.....	2
ECE 3107 Introduction to System Software III.....	2
ECE 3108 Introduction to Signals and Systems.....	4
ECE 3120 Power Circuit Analysis I.....	2
ECE 3130 Electric Machinery Theory I.....	2

Computer Engineering

<u>Course Requirements</u>	<u>Full-time With Thesis</u>	<u>Full-time With Seminar</u>	<u>Part-time Study</u>
Required Core Courses.....	12 QH	12 QH	12 QH
Subject Area Required Courses.....	12 QH	12 QH	12 QH
Subject Area Elective Courses.....	12 QH	16 QH	20 QH
Master of Science Thesis or Seminar....	8 QH	4 QH	0
Minimum Quarter Hours Required*.....	44 QH	44 QH	44 QH

*exclusive of any prerequisite courses

Required Core Courses (2 QH equivalents are in parentheses)	Credits
ECE 3211 (3212,3213) Math Methods in Electrical Engineering I.....	4
ECE 3221 (3222,3223) Linear Systems Analysis.....	4
ECE 3241 (3242,3243) Applied Probability & Stochastic Processes.....	4
Subject Area Required Courses	
ECE 3311 (3312,3313) Software Engineering.....	4
ECE 3321 (3322,3323) Digital Signal Processing.....	4
ECE 3391 (3392,3393) Digital Computer Architecture.....	4
Subject Area Elective Courses	
ECE 3200 Mathematical Methods in Computer Science.....	2
ECE 3231 (3232,3233) Math Methods in Electrical Engineering II.....	4
ECE 3325 (3326,3327) Numerical Methods & Computer Applications I....	4
ECE 3328 Numerical Methods and Computer Applications II.....	2
ECE 3331 (3332,3333) Analog Integrated Circuits.....	4
ECE 3341 (3342,3343) Electromagnetic Theory.....	4
ECE 3351 (3352,3353) Digital Communications.....	4
ECE 3361 (3362,3363) Detection and Estimation Theory.....	4
ECE 3371 (3372,3373) Linear Optimal Control Theory.....	4
ECE 3381 (3382,3383) Classical Control Theory.....	4
ECE 3394 Microprogramming.....	2
ECE 3395 (3396,3397) VLSI Design.....	4
ECE 3398 (3399,3400) VLSI Architectures.....	4
ECE 3440 (3441,3442) Microprocessor - Based Design.....	4
ECE 3443 (3444,3445) Theory of Computation.....	4
ECE 3447 (3448,3449) Switching Theory I.....	4
ECE 3450 Switching Theory II.....	2
ECE 3451 (3452,3453) Combinatorial Methods & Optimization Tech.....	4
ECE 3454 Graph Theory.....	2
ECE 3460 Special Topics in Computer Engineering.....	2
ECE 3463 (3464,3465) Robotic Sensors.....	4
ECE 3466 (3467,3468) Intelligent Robots.....	4
ECE 3469 (3470,3471) Fault-Tolerant Computers.....	4
ECE 3502 Special Topics in DSP - Fast Algorithms.....	2
ECE 3503 Two-Dimensional Digital Signal Processing.....	2
ECE 3505 (3506,3507) Digital Image Processing.....	4
ECE 3508 (3509,3510) Modern Spectral Analysis.....	4
ECE 3511 (3512,3513) Data Communications Networks.....	4
ECE 3514 (3515,3516) Error Correcting Codes.....	4
ECE 3521 Multidimensional Spectrum Estimation.....	2
ECE 3522 Array Signal Processing.....	2
ECE 3531 (3532,3533) Adaptive Signal Processing.....	4
ECE 3534 (3535,3536) Digital Processing of Speech Signals.....	4
ECE 3589 Optical Storage and Display.....	2
ECE 3623 (3624,3625) Gate Array Design.....	4
ECE 3626 (3627,3628) Integrated Circuits Fabrications Proc. I.....	4
ECE 3629 (3630,3631) Integrated Circuits Fabrications Proc. II.....	4
ECE 3632 (3633,3637) Design & Analysis of Digital Integ. Circ. II....	4
ECE 3646 (3647,3648) Multivariable Control Systems.....	4
ECE 3893 Special Problems in Electrical Engineering.....	2 or 4

COM 3205	Software Design and Development.....	4
COM 3450	Syntactic Pattern Recognition.....	4
COM 3640	Parallel Computation.....	4
Master of Science Thesis	ECE 3860.....	8
or		
Master of Science Seminar	ECE 3887,3888.....	2 each

Communications and Signal Processing

Course Requirements	Full-time With Thesis	Full-time With Seminar	Part-time Study
Required Core Courses.....	12 QH	12 QH	12 QH
Subject Area Required Courses.....	12 QH	12 QH	12 QH
Subject Area Elective Courses.....	12 QH	16 QH	20 QH
Master of Science Thesis or Seminar....	8 QH	4 QH	0
Minimum Quarter Hours Required*.....	44 QH	44 QH	44 QH
*exclusive of any prerequisite courses			
Required Core Courses (2 QH equivalents are in parentheses)			Credits
ECE 3211 (3212,3213) Math Methods in Electrical Engineering I.....	4		
ECE 3221 (3222,3223) Linear Systems Analysis.....	4		
ECE 3241 (3242,3243) Applied Probability & Stochastic Processes.....	4		
Subject Area Required Courses			
ECE 3321 (3322,3323) Digital Signal Processing.....	4		
ECE 3351 (3352,3353) Digital Communications.....	4		
ECE 3361 (3362,3363) Detection and Estimation Theory.....	4		
Subject Area Elective Courses			
ECE 3231 (3232,3233) Math Methods in Electrical Engineering II.....	4		
ECE 3325 (3326,3327) Numerical Methods and Computer Applications I..	4		
ECE 3331 (3332,3333) Analog Integrated Circuits.....	4		
ECE 3341 (3342,3343) Electromagnetic Theory.....	4		
ECE 3344 (3345,3346) Principles of Microwave Engineering.....	4		
ECE 3371 (3372,3373) Linear Optimal Control Theory.....	4		
ECE 3381 (3382,3383) Classical Control Theory.....	4		
ECE 3391 (3392,3393) Digital Computer Architecture.....	4		
ECE 3395 (3396,3397) VLSI Design.....	4		
ECE 3398 (3399,3400) VLSI Architectures.....	4		
ECE 3451 (3452,3453) Combinatorial Methods & Optimization Tech.....	4		
ECE 3502 Special Topics in DSP: Fast Algorithms.....	2		
ECE 3503 Two-Dimensional Digital Signal Processing.....	2		
ECE 3505 (3506,3507) Digital Image Processing.....	4		
ECE 3508 (3509,3510) Modern Spectral Analysis.....	4		
ECE 3511 (3512,3513) Data Communications Networks.....	4		
ECE 3514 (3515,3516) Error Correcting Codes.....	4		
ECE 3517 Information Theory.....	2		
ECE 3520 Special Topics in Communication Theory.....	2		
ECE 3521 Multidimensional Spectrum Estimation.....	2		
ECE 3522 Array Signal Processing.....	2		
ECE 3523 (3524,3525) Communication Systems.....	4		
ECE 3527,3528,3529 Nonlinear Systems I, II, III.....	2		each
ECE 3530 Three Dimensional Picture Processing.....	2		
ECE 3531 (3532,3533) Adaptive Signal Processing.....	4		
ECE 3534 (3535,3536) Digital Processing of Speech Signals.....	4		
ECE 3537 (3538,3539) Multi-User Communications Systems.....	4		
ECE 3540 (3541,3542) Digital Control System.....	4		
ECE 3543 (3544,3545) Stochastic Control Theory.....	4		
ECE 3560,3561,3562 Acoustics I, II, III.....	2		each
ECE 3564,3565,3566 Radar Systems I, II, III.....	2		each
ECE 3572,3573,3574 Fourier Optics I, II, III.....	2		each
ECE 3579 Optoelectronics and Fiber Optics.....	2		
ECE 3580 Electro-Optics I.....	2		
ECE 3635 (3636,3637) Antennas and Radiation.....	4		
ECE 3646 (3647,3648) Multivariable Control Systems.....	4		
ECE 3893 Special Problems in Electrical Engineering.....	2 or 4		
Master of Science Thesis ECE 3860.....	8		
or Master of Science Seminar ECE 3887,3888.....	2		each

Control Systems and Signal Processing

<u>Course Requirements</u>	<u>Full-time With Thesis</u>	<u>Full-time With Seminar</u>	<u>Part-time Study</u>
Required Core Courses.....	12 QH	12 QH	12 QH
Subject Area Required Courses.....	12 QH	12 QH	12 QH
Subject Area Elective Courses.....	12 QH	16 QH	20 QH
Master of Science Thesis or Seminar....	8 QH	4 QH	0
Minimum Quarter Hours Required*.....	44 QH	44 QH	44 QH
*exclusive of any prerequisite courses			
Required Core Courses (2 QH equivalents are in parentheses)	Credits		
ECE 3211 (3212,3213) Math Methods in Electrical Engineering I.....	4		
ECE 3221 (3222,3223) Linear Systems Analysis.....	4		
ECE 3241 (3242,3243) Applied Probability & Stochastic Processes.....	4		
Subject Area Required Courses			
ECE 3321 (3322,3323) Digital Signal Processing.....	4		
ECE 3371 (3372,3373) Linear Optimal Control Theory.....	4		
ECE 3381 (3382,3383) Classical Control Theory.....	4		
Subject Area Elective Courses			
ECE 3231 (3232,3233) Math Methods in Electrical Engineering II.....	4		
ECE 3325 (3326,3327) Numerical Methods and Computer Applications.I.....	4		
ECE 3331 (3332,3333) Analog Integrated Circuits.....	4		
ECE 3341 (3342,3343) Electromagnetic Theory.....	4		
ECE 3351 (3352,3353) Digital Communications.....	4		
ECE 3361 (3362,3363) Detection and Estimation Theory.....	4		
ECE 3391 (3392,3393) Digital Computer Architecture.....	4		
ECE 3395 (3396,3397) VLSI Design.....	4		
ECE 3398 (3399,3400) VLSI Architectures.....	4		
ECE 3440 (3441,3442) Microprocessor-Based Design.....	4		
ECE 3451 (3452,3453) Combinatorial Methods & Optimization Tech.....	4		
ECE 3463 (3464,3465) Robotic Sensors.....	4		
ECE 3466 (3467,3468) Intelligent Robots.....	4		
ECE 3502 Special Topics in DSP: Fast Algorithms.....	2		
ECE 3503 Two-Dimensional Digital Signal Processing.....	2		
ECE 3505 (3506,3507) Digital Image Processing.....	4		
ECE 3508 (3509,3510) Modern Spectral Analysis.....	4		
ECE 3511 (3512,3513) Data Communication Networks.....	4		
ECE 3514 (3515,3516) Error Correcting Codes.....	4		
ECE 3517 Information Theory.....	2		
ECE 3520 Special Topics in Communication Theory.....	2		
ECE 3521 Multidimensional Spectrum Estimation.....	2		
ECE 3522 Array Signal Processing.....	2		
ECE 3523 (3524,3525) Communication Systems.....	4		
ECE 3527,3528,3529 Nonlinear Systems I, II, III.....	2 each		
ECE 3530 Three-Dimensional Picture Processing.....	2		
ECE 3531 (3532,3533) Adaptive Signal Processing.....	4		
ECE 3534 (3535,3536) Digital Processing of Speech Signals.....	4		
ECE 3540 (3541,3542) Digital Control Systems.....	4		
ECE 3543 (3544,3545) Stochastic Control Theory.....	4		
ECE 3560,3561,3562 Acoustics I, II, III.....	2 each		
ECE 3564,3565,3566 Radar Systems I, II, III.....	2 each		
ECE 3572,3573,3574 Fourier Optics I, II, III.....	2 each		
ECE 3646 (3647,3648) Multivariable Control Systems.....	4		
ME 3468 Robot Mechanics and Control.....	4		
ECE 3893 Special Problems in Electrical Engineering.....	2 or 4		
Master of Science Thesis ECE 3860.....	8		
or			
Master of Science Seminar ECE 3887,3888.....	2 each		

Electronic Circuits and Semiconductor Devices

<u>Course Requirements</u>	<u>Full-time With Thesis</u>	<u>Full-time With Seminar</u>	<u>Part-time Study</u>
Required Core Courses.....	12 QH	12 QH	12 QH
Subject Area Required Courses.....	12 QH	12 QH	12 QH
Subject Area Elective Courses.....	12 QH	16 QH	20 QH
Master of Science Thesis or Seminar....	8 QH	4 QH	0
Minimum Quarter Hours Required*.....	44 QH	44 QH	44 QH

*exclusive of any prerequisite courses

Required Core Courses (2 QH equivalents are in parentheses)		Credits
ECE 3211 (3212,3213) Math Methods in Electrical Engineering I.....	4	4
ECE 3221 (3222,3223) Linear Systems Analysis.....	4	4
ECE 3241 (3242,3243) Applied Probability & Stochastic Processes.....	4	4
Subject Area Required Courses		
ECE 3331 (3332,3333) Analog Integrated Circuits.....	4	4
ECE 3384 (3385,3386) Char. & Models of Solid State Devices I.....	4	4
ECE 3395 (3396,3397) VLSI Design.....	4	4
Subject Area Elective Courses		
ECE 3321 (3322,3323) Digital Signal Processing.....	4	4
ECE 3341 (3342,3343) Electromagnetic Theory.....	4	4
ECE 3344 (3345,3346) Principles of Microwave Engineering.....	4	4
ECE 3389 (3390,3391) Characteristics & Mod. of Solid State Dev. II.....	4	4
ECE 3391 (3392,3393) Digital Computer Architecture.....	4	4
ECE 3398 (3399,3400) VLSI Architectures.....	4	4
ECE 3440 (3441,3442) Microprocessor - Based Design.....	4	4
ECE 3523 (3524,3525) Communication Systems.....	4	4
ECE 3610 (3611,3612) Electronics of Analog Signal Processing.....	4	4
ECE 3613 (3614,3615) UHF and Microwave Devices.....	4	4
ECE 3616 (3617,3618) Active Network Synthesis & Design.....	4	4
ECE 3619 (3620,3621) Network Synthesis.....	4	4
ECE 3622 Special Topics in Electronics - Analog MOS LSI.....	2	2
ECE 3623 (3624,3625) Gate Array Design.....	4	4
ECE 3626 (3627,3628) Integrated Circuits Fabrication Proc. I.....	4	4
ECE 3629 (3630,3631) Integrated Circuits Fabrication Proc. II.....	4	4
ECE 3632 (3633,3634) Design & Analysis of Digital Integrated Cir....	4	4
ECE 3893 Special Problems in Electrical Engineering.....	2 or 4	2 or 4
Master of Science Thesis ECE 3860.....	8	8
or		
Master of Science Seminar ECE 3887,3888.....	2 each	2 each

Fields, Waves and Optics

<u>Course Requirements</u>	<u>Full-time With Thesis</u>	<u>Full-time With Seminar</u>	<u>Part-time Study</u>
Required Core Courses.....	12 QH	12 QH	12 QH
Subject Area Required Courses.....	12 QH	12 QH	12 QH
Subject Area Elective Courses.....	12 QH	16 QH	20 QH
Master of Science Thesis or Seminar....	8 QH	4 QH	0
Minimum Quarter Hours Required*.....	44 QH	44 QH	44 QH
*exclusive of any prerequisite courses			
Required Core Courses (2 QH equivalents are in parentheses)			Credits
ECE 3211 (3212,3213) Math Methods in Electrical Engineering I.....			4
ECE 3221 (3222,3223) Linear Systems Analysis.....			4
ECE 3241 (3242,3243) Applied Probability & Stochastic Processes.....			4
Subject Area Required Courses			
ECE 3341 (3342,3343) Electromagnetic Theory.....			4
ECE 3344 (3345,3346) Principles of Microwave Engineering.....			4
ECE 3347 (3348,3349) Computational Methods in Electromagnetics.....			4
Subject Area Electives Courses			
ECE 3231 (3232,3233) Math Methods in Electrical Engineering II.....			4
ECE 3321 (3322,3323) Digital Signal Processing.....			4
ECE 3384 (3385,3386) Char. & Models of Solid State Devices I.....			4
ECE 3395 (3396,3397) VLSI Design.....			4
ECE 3523 (3524,3525) Communication Systems.....			4
ECE 3560,3561,3562 Acoustics I, II, III.....			2 each
ECE 3564,3565,3566 Radar Systems I, II, III.....			2 each
ECE 3572,3573,3574 Fourier Optics I, II, III.....			2 each
ECE 3576,3577,3578 Lasers I, II, III.....			2 each
ECE 3579 Optoelectronics and Fiber Optics.....			2
ECE 3580,3581 Electro-Optics I, II.....			2 each
ECE 3583,3584,3585 Optical Properties of Matter I, II, III.....			2 each
ECE 3587,3588 Principles of Optical Detection I, II.....			2 each
ECE 3589 Optical Storage and Display.....			2
ECE 3590 Optical Instrumentation Design.....			2
ECE 3591 Spectroscopic Instrumentation.....			2
ECE 3592 Remote Sensing.....			2
ECE 3593 Plasma Engineering.....			2
ECE 3594 (3595,3596) Plasma Theory.....			4
ECE 3600 (3601,3602) Microwave Properties of Materials.....			4
ECE 3603 (3604,3605) Propagation in Artificial Structures.....			4
ECE 3606 (3607,3608) Applications of Plasma Engineering.....			4
ECE 3613 (3614,3615) UHF and Microwave Devices.....			4
ECE 3626 (3627,3628) Integrated Circuits Fabrication Proc. I.....			4
ECE 3629 (3630,3631) Integrated Circuits Fabrication Proc. II.....			4
ECE 3635 (3636,3637) Antennas and Radiation.....			4
ECE 3893 Special Problems in Electrical Engineering.....			2 or 4
Master of Science Thesis ECE 3860.....			8
or			
Master of Science Seminar ECE 3887,3888.....			2 each

Power Systems

<u>Course Requirements</u>	<u>Full-time With Thesis</u>	<u>Full-time With Seminar</u>	<u>Part-time Study</u>
Required Core Courses.....	12 QH	12 QH	12 QH
Subject Area Required Courses.....	12 QH	12 QH	12 QH
Subject Area Elective Courses.....	12 QH	16 QH	20 QH
Master of Science Thesis or Seminar....	8 QH	4 QH	0
Minimum Quarter Hours Required*.....	44 QH	44 QH	44 QH
*exclusive of any prerequisite courses			
Required Core Courses (2 QH equivalents are in parentheses)			Credits
ECE 3211 (3212,3213) Math Methods in Electrical Engineering I.....			4
ECE 3221 (3222,3223) Linear Systems Analysis.....			4
ECE 3241 (3242,3243) Applied Probability & Stochastic Processes.....			4
Subject Area Required Courses			
ECE 3302,3303 Power Circuit Analysis II, III.....			2 each
ECE 3305 Computers in Power Systems I.....			2
ECE 3308 Electric Machinery Theory II.....			2
ECE 3341 (3342,3343) Electromagnetic Theory.....			4
Subject Area Elective Courses			
ECE 3304 Solid State AC and DC Motor Control Systems.....			2
ECE 3306 Computers in Power Systems II.....			2
ECE 3309 Electric Machinery Theory III.....			2
ECE 3371 (3372,3373) Linear Optimal Control Theory.....			4
ECE 3381 (3382,3383) Classical Control Theory.....			4
ECE 3412 Power Systems Planning.....			2
ECE 3415 Power Systems Protection.....			2
ECE 3416 Power Systems Transients.....			2
ECE 3423 Special Topics in Power.....			2
ECE 3424 Power System Dynamics.....			2
ECE 3430,3431 Studies in Electric Power Transmission I, II.....			2 each
ECE 3893 Special Problems in Electrical Engineering.....			2 or 4
ME 3200 (3201,3202) General Thermodynamics.....			4
ME 3343 Power Generation Economics & Planning.....			2
ME 3386,3387,3388 Nuclear Engineering I, II, III.....			2 each
Master of Science Thesis ECE 3860.....			8
or			
Master of Science Seminar ECE 3887,3888.....			2 each

The Electrical Engineer Degree

The Department of Electrical and Computer Engineering offers the graduate professional degree usually known as the Engineer Degree. This degree usually requires about one year of full-time graduate study beyond the Master of Science degree and may also be pursued on a part-time basis. The official title of the degree is "Electrical Engineer".

Qualification, Degree Candidacy and Examinations

A student admitted to the Engineer Degree program will be designated as a candidate for this degree. In order to qualify for the degree, a student must maintain a 3.00 grade point average and receive no "F's". In some instances, a student may be required to take special examinations. Such examinations will be determined in each case by the departmental graduate committee.

Course Requirements

The minimum course requirements are 40 quarter hours beyond the Master of Science degree. No more than 10 out of the 40 quarter hours of credit are allowed for thesis and special problems combined. A minimum of 20 quarter hours must be taken in regularly scheduled electrical engineering subjects. All candidates must register for a minimum of 4 quarter hours of course work each quarter as approved by their academic advisor. Registration must be continuous unless withdrawal is approved by the department graduate committee.

Approval for transfer of credit may be given by the departmental graduate committee upon written request from the student. Such requests should be submitted at the time of application to the program. A maximum of 10 quarter hours of credit may be transferred from another school but transfer credits for thesis are not allowed.

After admission to the program, a maximum of 5 years will be allowed for completion of the degree requirements. Extension of this time limit may be granted by the departmental graduate committee.

Language Requirement

No foreign language is required for the Electrical Engineer degree.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the same academic year or part-time graduate work during a period of two consecutive academic years subject to approval of the advisor.

Thesis

Each Engineer Degree student must complete a thesis which demonstrates a high level of competence in research, development, or design in the field of electrical engineering. Thesis registration must total at least 6 quarter hours of graduate work. In no case will more than 10 quarter hours be credited towards the degree requirements.

In some cases a Master of Science thesis of superior quality may be used to satisfy the thesis requirement.

A Thesis Examination Committee shall be formed consisting of the student's major advisor and two full-time faculty members (or one full-time faculty member and one advisor from industry) with background relevant to the thesis topic. The thesis shall be presented to the Committee and to the ECE Department-at-large in the form of a seminar presentation before final approval of the thesis is granted.

The Doctor of Philosophy Degree

Qualifying Examination and Degree Candidacy

First, and foremost, the PhD Qualifying Examination is the entrance examination for the admission to the doctoral program. In addition, this examination has the dual purpose of 1): serving as an indicator of the student's capability for successful completion of the program, and 2): serving as a guide to his or her advisor in developing a suitable plan of study tailored to the individual needs of the candidate. A student who has received approval to take the qualifying examination is considered a pre-doctoral student until such time as he or she passes the examination. Upon successful completion of the qualifying examination he or she becomes a PhD candidate.

With these goals in mind, the candidate is urged to take the qualifying examination early in his or her graduate program (i.e., not later than the successful completion of 40 quarter hours of graduate work). The examination is composed of a written and an oral part, and is usually given in the spring quarter of each academic year. For the written part, the student is required to choose three out of the following five areas of concentration:

1. Signals and Systems
2. Fields, Waves and Optics
3. Circuits and Electronics
4. Computer Engineering
5. Energy Conversion and Power Systems

One of the three areas should be that closest to the specialty area in which the student plans to do his or her doctoral thesis work.

The oral part is designed to test general comprehension. Together, the oral and written portions of the examination review the factual knowledge of a typical undergraduate Electrical Engineering program and the understanding of that material from a more mature point of view.

If the examination is failed it may be repeated only with permission of the Graduate Committee upon recommendation of the PhD Qualifying Examination Committee.

Course Requirements

Successful completion of a doctoral program normally requires a minimum of 70 quarter hours of satisfactory graduate level work beyond the Bachelor of Science degree, exclusive of doctoral seminar (required), doctoral reading, and doctoral dissertation.

The course work must include a three-course sequence (12 QH graduate level courses) in each of two minor areas. Both minors must be science, applied science, or a related area. One minor may be chosen from an area of electrical engineering outside the candidate's proposed major area.

Language Requirement

The language requirement may be satisfied in French, German or Russian, with an additional option of English for PhD candidates for whom English is not the native language. Proficiency is tested by way of the Graduate School Foreign Language Exam administered at the University.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's advisor in order to give evidence that at least half of the time is being devoted to the requirements of the graduate school.

Dissertation

The candidate's dissertation research is directed by a Dissertation Advisor, whom he or she shall select after establishing candidacy. A Dissertation Committee shall be formed consisting of the Advisor and two full-time faculty members with background relevant to the thesis topic. The Committee may also include a person from industry. The Dissertation Committee will approve the dissertation in final form.

Comprehensive Examination

Within three years of his or her establishment of degree candidacy, the student will be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

The comprehensive examination is an oral examination open to the Department of Electrical and Computer Engineering faculty (assistant professor and above in rank) and administered by the student's Dissertation Committee. Departmental faculty will be informed of the examination via a departmental notice at least one week prior to the examination. Normally the examination will be given at the time the Dissertation Proposal is submitted to the Dissertation Committee for approval. As part of this examination the Dissertation Committee will review the student's doctoral program and his or her performance in graduate courses, as well as examine the student on subject matter related to graduate studies and dissertation area.

Final Oral Examination

The final oral examination will include the subject matter of the doctoral dissertation and significant developments in the field of the dissertation work. Other related fields may be included if recommended by the examining committee.

Faculty

John G. Proakis, Chairman

Professors

Dolansky, Ladislav, PhD, Harvard University; speech processing and acoustics
Feldman, James, PhD, Carnegie Mellon; physical electronics, computers, energy systems processing, robotics
Gabel, Arvin, ScD, New York University; circuit theory, electronics
Grojman, Richard, MS, Tufts University; electro-optics, optical instrumentation
Mullukulta, Sama, PhD, University of Colorado; power systems, electrical machinery, electromagnetic theory and its applications to electrical machines
Proakis, John, PhD, Harvard University; digital communications, adaptive filtering, estimation, and digital signal processing
Raemer, Harold, PhD, Northwestern University; electromagnetic theory, communications, radar system analysis, microwave theory, electromagnetic scattering, plasma theory
Remillard, Wilfred, PhD, Harvard University; acoustics, numerical analysis, computers
Rocheffort, J. Spencer, MS, MIT; communications, electronics, space telemetry
Sandler, Sheldon, PhD, Harvard University; electromagnetics, antennas, pattern recognition, robotics
Schetzen, Martin, ScD, MIT; systems theory, control systems, theory of nonlinear systems
Schwab, Walter, PhD, MIT; electronic circuits, integrated circuits, VLSI
Serafim, Philip, ScD, MIT; electromagnetics, remote sensing
Silevitch, Michael, PhD, Northeastern University; plasma theory, applications of plasma theory to auroral phenomena
Stuart, Robert, PhD, Cambridge University; computer engineering, electronic circuits, VLSI
Vittoria, Cammine, PhD, Yale; electromagnetics, magnetic materials, microwave circuits

Associate Professors

Carrabes, Marcello, MS, Northeastern University; mathematical and numerical techniques in engineering
Deller, John, PhD, Michigan; digital signal processing, speech processing
Glover, John D., ScD, MIT; power systems, control systems
Hinchey, Sheila Prasad, PhD, Harvard University; electromagnetic theory, antennas, antennas in lossy media, arrays, microstrip
Kellner, Wayne, ScD, MIT; circuit theory, graph theory, computer science
Lob, Walter, MS, MIT; communications theory, communications systems, electronics
Martin, Robert, MS, Northeastern University; circuit theory
Retter, Charles, PhD, Johns Hopkins; computer systems, coding theory

Assistant Professors

Ames, Elizabeth, PhD, Northeastern University; electromagnetics, vacuum arcs
Buus, Soren, PhD, Northeastern University; psychoacoustics, signal processing, microprocessors
Chan, Chung, PhD, Iowa; plasmas, electromagnetics
Farhat, Amir, PhD, University of Pennsylvania; physical electronics, electronic circuits, integrated circuits, VLSI
Ingle, Vinaykumar, PhD, Rennselaer Polytechnic Institute; signal processing, image processing
Jacobson, Clas, PhD, RPI; control systems
Kai, Francis Yee Tat, PhD, SUNY at Buffalo; physical electronics
Keller, Catherine, PhD, Illinois, communications, spread spectrum, networks
Manolakis, Dimitris, PhD, University of Athens (Greece); communications, digital signal processing, VLSI architecture
Merakos, Lazaros, PhD, Connecticut; communications, networks
Moon, Paul, PhD, Virginia; computer engineering, robotics
Nikias, Chrysostomos, PhD, SUNY Buffalo; digital signal processing, image processing, spectral estimation
Raghavan, Ram, PhD, Massachusetts; microwaves, remote sensing, electromagnetics
Richardson, Albert, PhD, Pennsylvania State University; semiconductor devices, VLSI design, microprocessor-based design.
Shafai, Bahram, PhD, George Washington; control systems, digital signal processing
Singh, Amar, PhD, VPISU; electronics, VLSI design

Tsui, David Chia-Chi, PhD, SUNY at Stony Brook; control systems

Valavanis, Kimon, PhD, RPI; robotics, control systems

Wagdy, Mahmoud, PhD, Kansas State University; computer-controlled electronic instrumentation

Advisors

An advisor will be assigned to you upon admission to the Graduate School.

If you are unable to reach your advisor, you may call the Electrical and Computer Engineering Department office at 437-2164.

ELECTRICAL AND COMPUTER ENGINEERING

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time.

ECE 3100 Introduction to Circuits and Systems (4QH)

(formerly 03.846)

Fall Quarter

The circuit elements (R, L and C) are introduced. Kirchoff's Laws, Tellegen and Thevenin's Theorem. Mesh and nodal analysis. Development of system function approach, Laplace and Fourier transform theory applied to circuit analysis. Sinusoidal steady-state, n-port network theory and power and energy concepts. Prep. Admission to Graduate School

ECE 3101 Introduction to Electronics (4QH)

(formerly 03.847)

Winter Quarter

Characteristics of the theoretical physical junction. The Ebers-Moll model for bipolar junction transistors, characteristics of bipolar and field-effect devices, basic digital inverters and logic gates and various logic families. Use of transistors in the design of analog circuits. Biasing, linearized incremental models, load lines, signal flowgraphs, frequency response and gain calculation for single and cascaded stages. Prep. ECE 3100 or equivalent.

ECE 3102 Introduction to Electromagnetic Field Theory (4QH)

(formerly 03.848)

Spring Quarter

Definition of scalar and vector fields; vector calculus; concepts of gradient, divergence, curl and the "del" operator; free-space electrostatics; the generalization of the Maxwell equations to the case of time-varying fields; Faraday induction law, wave equations and the plane wave solution. Prep. ECE 3100 or equivalent.

ECE 3103 Introduction to Digital Computers (4QH)

(formerly 03.849)

Fall Quarter

Basic components of digital systems and methods for their analysis and design, combinational and sequential circuits, integrated circuit logic families and functional building blocks, registers, counters, decoders, multiplexers and memories. Data representation and coding techniques. Central processor alternatives; instruction formats, addressing modes, bus structures, arithmetic units, timing analysis and stacks. Algorithms for arithmetic operations with various data representations. Prep. Admission to Graduate School

ECE 3104 Introduction to Communications (4QH)

(formerly 03.850)

Spring Quarter

Review of system theory, convolution, Fourier series, Fourier integral, signal analysis, Fourier methods, correlation functions, density functions, power spectra, amplitude modulation, frequency modulation, phase modulation, sampling theory and digital modulation techniques. Prep. ECE 3108 or equivalent.

ECE 3105 Introduction to System Software I (2QH)

Fall Quarter

A knowledge of Pascal is helpful but not required for this course. Programming style considerations software testing software reliability. Data structures, including stacks, queues, linked lists, trees and graphs. The course emphasizes the use of Pascal to implement typical system software routines that use the above data structures. Miscellaneous topics also discussed are modern system software considerations for multiprocessor, array processor and graphic processor systems. Prep. Admission to Graduate School.

ECE 3106 Introduction to System Software II (2QH)

Winter Quarter

An analysis of absolute and relocatable program translators. The topics covered are assemblers, disassemblers, macroassemblers, linkers, an overview of compilers, interpreters, simulators and emulators. For a typical lab assignment, the student will design and implement an absolute assembler for a very simplified instruction set. Prep. ECE 3105.

ECE 3107 Introduction to System Software III (2QH)

Spring Quarter

An analysis of operating system structure and concepts. Memory management, fragmentation, paging, virtual memory, job and process scheduling, I/O management, file management. Operating system concepts for multi-user systems. Critical variables, race conditions, Dekker's algorithm, some sample multi-user routines. For a typical lab assignment, the student will write simulated paged memory management and process scheduling routines. Prep. ECE 3106

ECE 3108 Introduction to Signals and Systems (4QH)

Winter Quarter

Description and analysis of continuous and discrete time signals and systems. Time domain analysis of linear, time-invariant (LTI) systems. Frequency domain analysis of signals and LTI systems. Laplace and z-transforms. State space descriptions of continuous and discrete time systems. Prep: ECE 3100 or equivalent.

ECE 3120 Power Circuit Analysis I (2QH)

(formerly 03.925)

Fall Quarter

Fundamental concepts of single-phase and polyphase power systems; definitions of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase systems; introduction of symmetrical components; short circuits on systems with a single power source. Prep. BSEE or ECE 3100 and ECE 3102.

ECE 3130 Electrical Machinery Theory I (2QH)

(formerly 03.940)

Fall Quarter

Review of magnetic circuit concepts and electromechanical energy-conversion principles; steady-state analysis of transformers, synchronous machines, and induction machines. Prep. BSEE or ECE 3100 and ECE 3102.

ECE 3200 Mathematical Methods in Computer Science (2QH)

(formerly 03.8A1)

Fall Quarter

Algebraic concepts relevant to computer science; sets, relations, mapping, orderings, algebraic systems, Boolean algebras, groups, rings, finite fields, introduction to vector spaces and linear algebras over finite fields. Prep. Admission to Graduate School.

ECE 3211 Mathematical Methods in Electrical Engineering I (4QH)

(formerly 03.823)

Fall and Winter Quarters

Fundamental Algebraic Concepts; Sets, functions, relations, operations; Algebraic Structures; group, rings, fields, homomorphisms, polynomials; Vector Spaces and Linear Operators; representations, matrices and linear algebraic equations, orthogonality, equivalence and similarity transformations, eigenvalues and eigenvectors, canonical forms, functions of a square matrix, quadratic forms and congruence transformations, orthogonal transformations; Introduction to Polynomial Matrices; Applications to Communications and Control Theory. Prep. Admission to Graduate School

ECE 3212 Mathematical Methods in Electrical Engineering I-A (2QH)

Fall and Winter Quarters

ECE 3212 and ECE 3213 cover the same material with the same prerequisites as ECE 3211, but in two 2QH courses.

ECE 3213 Mathematical Methods in Electrical Engineering I-B (2QH)

Winter and Spring Quarters

Continuation of ECE 3212. Prep. ECE 3212.

ECE 3221 Linear Systems Analysis (4QH)

Fall and Winter Quarters

Introduction to the state variable theory of continuous and discrete linear systems. Standard canonical representations. The concept of state and the representation of interconnected systems. Linear spaces. The state equations and their solution. Stability. Introduction to the general control problem in terms of controllability and observability. Prep. ECE 3211, ECE 3108 or equivalent.

ECE 3222 Linear Systems Analysis A (2QH)

Fall and Winter Quarters

ECE 3222 and ECE 3223 cover the same material with the same prerequisites as ECE 3221, but in two 2QH courses.

ECE 3223 Linear Systems Analysis B (2QH)

(formerly 03.826)

Winter and Spring Quarters

Continuation of ECE 3222. Prep. ECE 3222.

ECE 3231 Mathematical Methods in Electrical Engineering II (4QH)

Summer Quarter

Complex variable theory; Analytic functions and Cauchy-Riemann equations, complex integration and Cauchy integral formula, Taylor and Laurent Series, the residue theorem, conformal mapping; Laplace transform and its applications, problems in partial differential equations; Generalized Fourier Series and Green's functions; General integral transforms; Sturm-Liouville, Fourier, Hankel, Legendre and other integral transforms. Prep. Admission to Graduate School.

ECE 3232 Mathematical Methods in Electrical Engineering II-A (2QH)

(formerly 03.8C1)

Summer Quarter

ECE 3232 and ECE 3233 cover the same material with the same prerequisites as ECE 3231, but in two 2QH courses.

ECE 3233 Mathematical Methods in Electrical Engineering II-B (2QH)

(formerly 03.8C2)

Summer Quarter

Continuation of ECE 3232. Prep. ECE 3232

ECE 3241 Applied Probability and Stochastic Processes (4QH)

(formerly 03.902)

Fall and Winter Quarters

Introductory probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, description of stochastic vectors. General concepts of stochastic processes, stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, matched filtering, stochastic orthogonality and linear mean-square estimation filtering and prediction. Prep. ECE 3108 or equivalent.

ECE 3242 Applied Probability and Stochastic Processes A (2QH)

(formerly 03.900)

Fall and Winter Quarters

ECE 3242 and ECE 3243 cover the same material with the same prerequisites as ECE 3241, but in two 2QH courses.

ECE 3243 Applied Probability and Stochastic Processes B (2QH)

(formerly 03.901)

Winter and Spring Quarters

Continuation of ECE 3242. Prep. ECE 3242.

ECE 3302 Power Circuit Analysis II (2QH)

(formerly 03.926)

Winter Quarter

This course is a continuation of ECE 3120 Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from an application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems. Prep. ECE 3120.

ECE 3303 Power Circuit Analysis III (2QH)

(formerly 03.927)

Spring Quarter

This course is a continuation of ECE 3302, Power Circuit Analysis II. Introduction of Clarke components and applications in analysis of asymmetrical systems and faults; application of Clarke components to the solution of surge phenomena problems; transmission line theory; fundamentals of systems stability. Prep. ECE 3302.

ECE 3304 Solid State AC and DC Motor Control Systems (2QH)

(formerly 03.929)

Fall Quarter

The application of solid-state devices to the control of AC and DC electrical machinery, including rectifiers, inverters, choppers and cyclo-converters, as applied to drive systems in industry and transportation. The course will emphasize a case method approach. Prep. BSEE or ECE 3100 and ECE 3101, or equivalent.

ECE 3305 Computers in Power Systems I (2QH)

(formerly 03.935)

Fall Quarter

Techniques used in solving power system problems with the digital computer. Matrix formulations are examined, followed by a detailed treatment of the short-circuit problem, including balanced and unbalanced faults. Various iterative techniques are studied for the solution of the power-flow problem. Prep. ECE 3120.

ECE 3306 Computers in Power Systems II (2QH)

(formerly 03.936)

Winter Quarter

Practical considerations of solving large scale networks are discussed. Network reductions, distribution factors and contingency analysis techniques are developed. Digital models for regulated generators, fixed and load tap changing transformers and HVDC transmission lines are examined. Computer methods for economic dispatch, loss coefficients and application of pumped hydro are developed. Prep. ECE 3305.

ECE 3308 Electrical Machinery Theory II (2QH)

(formerly 03.941)

Winter Quarter

Mathematical description of a synchronous machine; per-unit representation; steady-state theory and transient performance; flux distribution and saturation in synchronous machines. Prep. ECE 3130.

ECE 3309 Electrical Machinery Theory III (2QH)

(formerly 03.942)

Spring Quarter

Review of transient behavior of synchronous machines; stability studies and excitation systems; synchronous machine modeling; generator protection; trends in development of large generators. Prep. ECE 3308.

ECE 3311 Software Engineering I (4QH)

(formerly 03.896)

Fall Quarter

An introduction to basic concepts in software engineering principles is given. Techniques of structured software design and testing are discussed along with issues of program reliability and complexity. Management techniques are touched upon and a case study of a typical large software problem is undertaken. Prep. ECE 3105, 3106, 3107 or equivalent, and a knowledge of a high level programming language.

ECE 3312 Software Engineering I-A (2QH)

(formerly 03.893)

Fall and Winter Quarters

ECE 3312 and ECE 3313 cover the same material with the same prerequisites as ECE 3311, but in two 2QH courses.

ECE 3313 Software Engineering I-B (2QH)

(formerly 03.894)

Winter and Spring Quarters

Continuation of ECE 3312. Prep. ECE 3312.

ECE 3314 Software Engineering II (2QH)

(formerly 03.895)

Spring Quarter

Focus turns away from the general issues of the first two courses in this sequence and towards a very specific issue, modular design of software. Issues of stepwise-refinement and top-down design are explored in depth and organizational/data-flow issues are considered. Prep. ECE 3311 or 3313.

ECE 3321 Digital Signal Processing (4QH)

(formerly 03.8T9)

Winter Quarter

Theory and practice of modern signal processing techniques. Characteristics of discrete signals and systems; sampling and A/D conversion; difference equations; convolution; the z-transform, the Fourier transform and the discrete Fourier transform; fast Fourier transform algorithms; chirp z-transform algorithm; digital filter realizations; design techniques for IIR and FIR digital filters; computer programs for filter design; quantization effects in digital signal processing. Prep. ECE 3221.

ECE 3322 Digital Signal Processing A (2QH)

(formerly 03.8T7)

Fall and Winter Quarters

ECE 3322 and ECE 3323 cover the same material with the same prerequisites as ECE 3321, but in two 2QH courses.

ECE 3323 Digital Signal Processing B (2QH)

(formerly 03.8T8)

Winter and Spring Quarters

Continuation of ECE 3322. Prep. ECE 3322.

ECE 3325 Numerical Methods and Computer Applications I (4QH)

(formerly 03.8T0)

Winter Quarter

Survey of numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving; roundoff and cumulative errors; roots of polynomials and nonlinear functions; systems of linear and nonlinear algebraic equations; orthogonal function, least square Chebyshev approximation of functions; interpolation; numeric quadrature; ordinary and partial differential equations. Prep. Admission to Graduate School and a working knowledge of FORTRAN.

ECE 3326 Numerical Methods and Computer Applications I-A (2QH)

(formerly 03.8T1)

Fall and Winter Quarters

ECE 3326 and ECE 3327 cover the same material with the same prerequisites as ECE 3325, but in two 2QH courses.

ECE 3327 Numerical Methods and Computer Applications I-B (2QH)

(formerly 03.8T2)

Winter and Spring Quarters

Continuation of ECE 3326. Prep. ECE 3326.

ECE 3328 Numerical Methods and Computer Applications II (2QH)

(formerly 03.8T3)

Spring Quarter

Spectral analysis, including fast Fourier transforms, Hilbert transforms, convolution, and correlation techniques. Optimization, including dynamic programming and steepest descent techniques. PERT and linear programming. Other selected topics. Prep. ECE 3325 or ECE 3327.

ECE 3331 Analog Integrated Circuits (4QH)
(formerly 03.842)

Fall Quarter

Active transistor circuits and systems are treated with emphasis on modern integrated circuit architectures. Bipolar and field-effect (NMOS and CMOS) implementations of analog circuits are presented. Characteristics and behaviors of analog I.C. structures are explored through the study of circuits such as, operational amplifiers, instrumentation amplifiers, voltage comparators, various types of filter configuration and integrators as well as multipliers and logarithmic amplifiers. Features covered include linearity, dynamic range, slew-rate limiting and speed and gain bandwidth trade-offs. The role of feedback in stabilizing, linearizing and otherwise enhancing the performance of analog circuits is treated in detail. Noise limitations on circuit performance are explored. Noise models of devices and circuits are developed, leading to the prediction of system noise performance and techniques for optimizing signal-to-noise ratios. Prep. ECE 3101 or equivalent.

ECE 3332 Analog Integrated Circuits A (2QH)
(formerly 03.840)

Fall Quarter

ECE 3332 and ECE 3333 cover the same material with the same prerequisites as ECE 3331, but in two 2QH courses.

ECE 3333 Analog Integrated Circuits B (2QH)
(formerly 03.841)

Winter Quarter

Continuation of ECE 3332. Prep. ECE 3332

ECE 3341 Electromagnetic Theory (4QH)
(formerly 03.877)

Fall Quarter

Review of Maxwell's equations, boundary conditions and density function. Potential functions, electromagnetic force and energy, propagation of electromagnetic waves in bounded and unbounded media, general theorems for the electromagnetic field, scattering and diffraction, application to the dipole antenna. Prep. ECE 3102 or equivalent.

ECE 3342 Electromagnetic Theory A (2QH)
(formerly 03.875)

Fall Quarter

ECE 3342 and ECE 3343 cover the same material with the same prerequisites as ECE 3341, but in two 2QH courses.

ECE 3343 Electromagnetic Theory B (2QH)
(formerly 03.876)

Winter Quarter

Continuation of ECE 3342. Prep. ECE 3342.

ECE 3344 Principles of Microwave Engineering (4QH)
(formerly 03.87G)

Winter Quarter

Generation of microwaves; transmission of waves in uniform and periodic structures, waveguides, stripline, microstrip and dielectric waveguides. Cavity resonators. Equivalent circuit representations, scattering parameters. Circulators and isolators. High power devices: klystrons, magnetrons and travelling-wave tubes, ferrite devices and gyratrons. Prep. ECE 3341.

ECE 3345 Principles of Microwave Engineering A (2QH)
(formerly 03.878)

Winter Quarter

ECE 3345 and ECE 3346 cover the same material with the same prerequisites as ECE 3344, but in two 2QH courses.

ECE 3346 Principles of Microwave Engineering B (2QH)
(formerly 03.879)

Spring Quarter

Continuation of ECE 3345. Prep. ECE 3345.

ECE 3347 Computational Methods in Electromagnetics (4QH)

(formerly 03.8H7)

Spring Quarter

Solutions to complex electromagnetic problems are presented using a variety of numerical and computational techniques. These techniques include: finite element methods, moment and functional methods. Applications will be made to applied problems and physical aspects will be emphasized. Prep: ECE 3341.

ECE 3348 Computational Methods in Electromagnetics A (2QH)

(formerly 03.8H5)

Fall Quarter

ECE 3348 and ECE 3349 cover the same material with the same prerequisites as ECE 3347, but in two 2QH courses.

ECE 3349 Computational Methods in Electromagnetics B (2QH)

(formerly 03.8H6)

Winter Quarter

Continuation of ECE 3348. Prep. ECE 3348.

ECE 3351 Digital Communications (4QH)

(formerly 03.9C3)

Winter Quarter

Deals with the theoretical and practical aspects of digital communications in the presence of channel distortion and additive noise. Topics covered include the basic binary and M-ary modulation techniques, namely, PSK, PAM, FSK, orthogonal and biorthogonal signals, and their performance in an additive Gaussian noise channel; signal waveforms constructed from binary block and convolutional codes; hard-decision decoding and soft-decision decoding of coded signal waveforms; performance of coded waveforms in an additive white Gaussian noise channel. Signal design techniques for band-limited channels; Nyquist criteria; effect of channel amplitude and delay distortion on digital signals; discussion of several adaptive equalization algorithms for combatting intersymbol interference; maximum likelihood sequence estimation and the Viterbi algorithm; the characterization of fading multipath channels; diversity reception techniques; coding for fading channels. Prep. ECE 3241 and ECE 3104 or equivalent.

ECE 3352 Digital Communications A (2QH)

(formerly 03.9C1)

Fall Quarter

ECE 3352 and ECE 3353 cover the same material with the same prerequisites as ECE 3351, but in two 2QH courses.

ECE 3353 Digital Communications B (2QH)

(formerly 03.9C2)

Winter Quarter

Continuation of ECE 3352. Prep. ECE 3352.

ECE 3361 Detection and Estimation Theory (4QH)

(formerly 03.909)

Winter Quarter

This course presents the classical theory of detection and estimation of signals in noise with emphasis on implementation of the theory. Particular topics include: hypothesis testing criteria; coherent detection of M-ary signals; diversity receiver; calculation of error probabilities. Detection in colored noise; parameter estimation using Bayes, maximum-likelihood, a maximum a posteriori criteria; applications of the theory to digital communications and radar. Prep. ECE 3241.

ECE 3362 Detection and Estimation Theory A (2QH)

(formerly 03.906)

Winter Quarter

ECE 3362 and ECE 3363 cover the same material with the same prerequisites as ECE 3361, but in two 2QH courses.

ECE 3363 Detection and Estimation Theory B (2QH)

(formerly 03.907)

Spring Quarter

Continuation of ECE 3362. Prep. ECE 3362.

- ECE 3371 Linear Optimal Control Theory (4QH)**
(formerly 03.9A8) Spring Quarter
Single-stage extrema problem; Lagrange multiplier method. Multi-stage extrema problems; calculus of variations. Hamiltonian, maximum principle, and dynamic programming. Examples and problems such as the linear regulator-servomechanism problem, minimum fuel-time problem and bang-bang control problem are treated. Prep: ECE 3221 and 3381.
- ECE 3372 Linear Optimal Control Theory A (2QH)**
(formerly 03.9A6) Winter Quarter
ECE 3372 and ECE 3373 cover the same material with the same prerequisites as ECE 3371, but in two 2QH courses.
- ECE 3373 Linear Optimal Control Theory B (2QH)**
(formerly 03.9A7) Spring Quarter
Continuation of ECE 3372. Prep. ECE 3372.
- ECE 3381 Classical Control Theory (4QH)**
(formerly 03.959) Fall Quarter
Basic systems modeling; steady state and transient response analysis. Introduction to root-locus plots, Bode plots, Nyquist plots, and Nichols chart. The design of first order cascade and feedback compensators using the above plots. Pole-zero synthesis techniques and design techniques for the optimal linear regulator problem. Prep: ECE 3108 or equivalent.
- ECE 3382 Classical Control Theory A (2QH)**
(formerly 03.957) Fall Quarter
ECE 3382 and ECE 3383 cover the same material with the same prerequisites as ECE 3381, but in two 2QH courses.
- ECE 3383 Classical Control Theory B (2QH)**
(formerly 03.958) Winter Quarter
Continuation of ECE 3382. Prep. ECE 3382.
- ECE 3384 Characteristics and Models of Solid State Devices I (4QH)**
(formerly 03.8G0) Winter Quarter
This course is designed to develop insight into the physics of semiconductors and the operation of semiconductor devices. Some of the important topics include: crystal structure, energy bands, carrier concentration at thermal equilibrium, semiconductor statistics, carrier transport phenomena, p-n junction theory, charge storage and diode transients, bipolar junction transistors, charge-control model, Gummel-Poon model. Prep: ECE 3103 or equivalent.
- ECE 3385 Characteristics and Models of Solid State Devices I-A (2QH)**
(formerly 03.8G1) Fall Quarter
ECE 3385 and ECE 3386 cover the same material with the same prerequisites as ECE 3384, but in two 2QH courses.
- ECE 3386 Characteristics and Models of Solid State Devices I-B (2QH)**
(formerly 03.8G2) Winter Quarter
Continuation of ECE 3385. Prep. ECE 3385.
- ECE 3388 Characteristics and Models of Solid State Devices II (4QH)**
Fall Quarter
Metal-semiconductor contacts, methods of measurement of barrier height, MIS diode, C-V measurement to evaluate the interface-trapped charges; MOSFET device and structure, device scaling and second-order effects, CMOS structure; solid state microwave devices such as MESFET, MODFET, and the heterojunction bipolar transistor (HBT) will be discussed. An examination of noise in the microwave devices will be included. Prep. ECE 3384.

ECE 3389 Characteristics and Models of Solid State Devices II-A (2QH)

Winter Quarter

ECE 3389 and 3390 cover the same material with the same prerequisites as ECE 3388, but in two 2 QH courses. Prep. ECE 3384.

ECE 3390 Characteristics and Models of Solid State Devices II-B

Spring Quarter

Continuation of ECE 3389. Prep. ECE 3389.

ECE 3391 Digital Computer Architecture (4QH)

(formerly 03.979)

Fall Quarter

Hardware Description Languages; the PDP-11 as a base architecture; VAX, 68000, 16000, RIDGE and 8086 as alternatives; ALU design a bit-slice example at the LSI level; ALU design - resource allocation in a complex ALU; memory design - problems of speed and dynamic allocations; RISC vs elaborate microcode - philosophy and practical examples. Prep: ECE 3103 or equivalent.

ECE 3392 Digital Computer Architecture A (2QH)

(formerly 03.972)

Fall and Winter Quarters

ECE 3392 and ECE 3393 cover the same material with the same prerequisites as ECE 3391, but in two 2QH courses.

ECE 3393 Digital Computer Architecture B (2QH)

(formerly 03.973)

Winter and Spring Quarters

Continuation of ECE 3392. Prep. ECE 3392

ECE 3394 Microprogramming (2QH)

(formerly 03.974)

Spring Quarter

Topics in microprogramming and emulation including microprogramming concepts and techniques; microprogramming design approach using register transfer notation and precedence graphs; microprogrammed computers, bit-slice microprogramming, microprogramming a specific machine for emulation using a microprogramming language and its simulator; current trends in microprogramming languages and support tools. Prep. ECE 3391 or 3393.

ECE 3395 VLSI Design (4QH)

(formerly 03.8E6)

Fall Quarter

MOS devices and circuits, electrical and logic design, logic arrays; fabrication, design rules, electrical parameters, delays; NMOS and CMOS subsystem design, examples; laboratory design project including layout design and verification. Prep. ECE 3101 and ECE 3103 or equivalent.

ECE 3396 VLSI Design A (2QH)

(formerly 03.8E4)

Fall Quarter

ECE 3396 and ECE 3397 cover the same material with the same prerequisites as ECE 3395, but in two 2QH courses.

ECE 3397 VLSI Design B (2QH)

(formerly 03.8E5)

Winter Quarter

Continuation of ECE 3396. Prep. ECE 3396.

ECE 3398 VLSI Architectures (4QH)

Winter Quarter

System clocking and system design issues; control processing data path design; systolic arrays; bit serial architectures; design for testability; introduction to silicon compilation; laboratory project. Prep. ECE 3395.

ECE 3399 VLSI Architectures A (2QH)

Winter Quarter

ECE 3399 and 3400 cover the same material with the same prerequisites as ECE 3398, but in two 2 QH courses. Prep. ECE 3395.

ECE 3400 VLSI Architectures B (2QH)

Spring Quarter

Continuation of ECE 3399. Prep. ECE 3399.

- ECE 3412 Power System Planning (4QH)**
(formerly 03.931) Spring Quarter
Engineering and economic considerations underlying the planning and development of modern interconnected power systems. Consideration of overall planning strategies involved in economic comparison of alternative development schemes. Prep. ECE 3120.
- ECE 3415 Power Systems Protection (2QH)**
(formerly 03.932) Winter Quarter
Consideration of protection applied to generation, transmission, and distribution. Investigation of the characteristics and operating principles of various methods of protective relaying; analysis of current techniques pertaining to system protection. Prep. ECE 3303.
- ECE 3416 Power System Transients (2QH)**
(formerly 03.933) Fall Quarter
Transients in power systems due to system switching, lightning, or faults. Traveling-wave phenomena; insulation coordination; overvoltages due to disturbances on the system; surge protection. Prep. ECE 3303.
- ECE 3423 Special Topics in Power (2QH)**
(formerly 03.944) Spring Quarter
Directed reading and discussion of topics of special interest in the power field. Series of lectures by guest speakers from industry on topics of particular interest to the power student. Prep. Permission of Instructor.
- ECE 3424 Power System Dynamics (2QH)**
(formerly 03.945) Spring Quarter
Transient system models; small and large scale oscillations; solution of swing equation for single and multi-generator cases; load frequency and voltage controllers and transient stability. Prep. ECE 3303.
- ECE 3430 Studies in Electric Power Transmission I (2QH)**
(formerly 03.955) Fall Quarter
Elements in the design of AC overhead transmission lines; thermal limitation, series and shunt compensation, environmental effects; consideration of transposition, induced effects, and insulation level. Underground alternatives to overhead lines. Elements of distribution. Prep. ECE 3303.
- ECE 3431 Studies in Electric Power Transmission II (2QH)**
(formerly 03.956) Winter Quarter
Fundamental concepts of high voltage DC power transmission; rectifier and inverter performance; regulation; protection; reactive power and filter requirements; practical arrangement of DC lines; the impact of a DC line on overall power system operation. Prep. ECE 3303.
- ECE 3440 Microprocessor-Based Design (4QH)**
(formerly 03.8F3) Fall and Spring Quarters
Bus interconnections; modular programming and I/O programming; serial and parallel interfacing; some peripheral chips; multiprogramming; multiprocessing; bit-slicing. Prep. ECE 3391.
- ECE 3441 Microprocessor-Based Design A (2QH)**
(formerly 03.8F1) Fall Quarter
ECE 3441 and ECE 3442 cover the same material with the same prerequisites as ECE 3440, but in two 2QH courses.
- ECE 3442 Microprocessor-Based Design B (2QH)**
(formerly 03.8F2) Winter Quarter
Continuation of ECE 3441. Prep. ECE 3441.

ECE 3443 Theory of Computation (4QH)

(formerly 03.8F0)

Spring Quarter

This course deals with basic abstract models of computation. Topics include Turing machines, primitive recursive functions, recursive systems of equations and abstract families of algorithms. Unsolvable problems are examined, along with the Recursion Theorem. Prep. ECE 3200.

ECE 3444 Theory of Computation A (2QH)

(formerly 03.985)

Fall Quarter

ECE 3444 and ECE 3445 cover the same material with the same prerequisites as ECE 3443, but in two 2QH courses.

ECE 3445 Theory of Computation B (2QH)

(formerly 03.986)

Winter Quarter

Continuation of ECE 3444. Prep. ECE 3444.

ECE 3447 Switching Theory I (4QH)

(formerly 03.966)

Spring Quarter

Logical design of combinational switching circuits, including minimization and decomposition of switching functions; multiple output networks; symmetric networks; threshold logic, fault detection. Logic design of sequential switching circuits including finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. Logical design of sequential switching circuits, including the finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. Prep. ECE 3200.

ECE 3448 Switching Theory I-A (2QH)

(formerly 03.967)

Fall Quarter

ECE 3448 and ECE 3449 cover the same material with the same prerequisites as ECE 3447, but in two 2QH courses.

ECE 3449 Switching Theory I-B (2QH)

(formerly 03.968)

Winter Quarter

Continuation of ECE 3448. Prep. ECE 3448.

ECE 3450 Switching Theory II (2QH)

(formerly 03.969)

Spring Quarter

Selected topics from the theory of finite automata, including such topics as machine experiments; information lossless machines; linear sequential machines; finite-state recognizers. Prep. ECE 3447 or 3449.

ECE 3451 Combinatorial Methods and Optimization Techniques (4QH)

(formerly 03.888)

Winter Quarter

An introductory course in applied combinatorial mathematics which treats selected topics in enumerative analysis. Particular subjects include permutations, combinations, generating functions, recurrence relations, and the principle of inclusion and exclusion. Polya's theory of counting; selected topics in optimization techniques, which include transport networks, matching theory, linear programming, and an introduction to dynamic programming. Prep. ECE 3200

ECE 3452 Combinatorial Methods and Optimization Techniques A (2QH)

(formerly 03.898)

Winter Quarter

ECE 3452 and ECE 3453 cover the same material with the same prerequisites as ECE 3451, but in two 2QH courses.

ECE 3453 Combinatorial Methods and Optimization Techniques B (2QH)

(formerly 03.899)

Spring Quarter

Continuation of ECE 3452. Prep. ECE 3452.

ECE 3454 Graph Theory (2QH)

(formerly 03.837)

Spring Quarter

Fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Selected applications of graph theory in such fields as network theory, switching theory, and computer science. Prep. ECE 3211.

ECE 3460 Special Topics in Computer Engineering (2QH)

(formerly 03.988)

Spring Quarter

Aspects of computer engineering not covered in other courses. The subject matter may change from year to year.

ECE 3463 Robotic Sensors (4QH)

Spring Quarter

The main theme of this course is acquisition and processing of information for robot control. The subject is divided into two parts along the functional use of sensory information. Internal sensors, which monitor the state of the robot system (joint load, balance, kinesthesia, temperature, etc.) are analyzed first. The external sensors, which allow the system to interact with the environment are the second major topic of the course. These include proximity, rangefinding and vision. Topics for study will be chosen from the following areas: low level vision, 3-D vision, real time image understanding, theory of shape, theory of motion, etc. The objective of the course is to analyze the pertinence of different sensory modalities to endow the next generation of robots with "intelligent" behavior. Students will be required to participate in the weekly research reviews. Each student will have to complete a design project by simulating relevant problems in LISP environment. Prep. Permission of Instructor.

ECE 3464 Robotic Sensors A (2QH)

Fall Quarter

ECE 3464 and ECE 3465 cover the same material with the same prerequisites as ECE 3463, but in two 2QH courses.

ECE 3465 Robotic Sensors B (2QH)

Winter Quarter

Continuation of ECE 3464. Prep. ECE 3464.

ECE 3466 Intelligent Robots (4QH)

(formerly 03.874)

Winter Quarter

The course focuses on studies of intelligent interactions between robots and their environments. An important issue is the implementation of a goal directed behavior with emphasis on sensory driven locomotion and manipulation. "Robot as an Intelligent Agent" is the general topic under which these concepts are introduced during the first three weeks of the course. The second major topic deals with attempts to constrain the problem of machine perception from an engineering point of view. Finally, the high level concepts such as learning, knowledge representation, adaptation and self-organization are discussed in the context of artificial intelligence. Prep. ECE 3463.

ECE 3467 Intelligent Robots A (2QH)

Winter Quarter

ECE 3467 and ECE 3468 cover the same material with the same prerequisites as ECE 3466, but in two 2QH courses.

ECE 3468 Intelligent Robots B (2QH)

Spring Quarter

Continuation of ECE 3467. Prep. ECE 3467.

ECE 3469 Fault-Tolerant Computers (4QH)

Winter Quarter

Concepts of computer systems structures and specifications; software and hardware interactions; failure and reliability; errors and faults. Study of different types of faults; fault prevention and fault tolerance; redundancy management; reliability and availability. Comparisons of existing fault-tolerant computer architectures such as SIFT, FTMP, Tandem 16, and Stratus/32. Techniques of error detection and error recovery. Mechanisms for damage confinement and damage assessment. Study of software fault tolerance techniques such as recovery block scheme, deadline mechanism, and N-version programming scheme. Prep. ECE 3391.

ECE 3470 Fault-Tolerant Computers A (2QH)

Winter Quarter

ECE 3470 and ECE 3471 cover the same material with the same prerequisites as ECE 3469, but in two 2QH courses.

ECE 3471 Fault-Tolerant Computers B (2QH)

Spring Quarter

Continuation of ECE 3470. Prep. ECE 3470.

ECE 3502 Special Topics in Digital Signal Processing - Fast Algorithms (2QH)

(formerly 03.8U4)

Fall Quarter

Fast algorithms for implementation of digital filters and discrete Fourier transforms: FFT, convolution algorithm, Number Theoretic Transforms (NTT), filtering computation, and polynomial transforms. Prep. ECE 3321.

ECE 3503 Two-Dimensional Digital Signal Processing (2QH)

(formerly 03.8U7)

Winter Quarter

This course is concerned with two-dimensional digital signal processing which is finding wide applications in many diversified areas. Covers 2-D shift invariant systems along with their stability, the 2-D Discrete Fourier Transform (DFT) and its FFT implementation, and 2-D digital filter design and implementation. Prep. ECE 3321.

ECE 3505 Digital Image Processing (4QH)

(formerly 03.9D3)

Spring Quarter

Topics include: generation of digital image from the source, image digitizers and display devices, image transforms, enhancement techniques such as histogram, equalization, edge sharpening etc.; restoration by Wiener and Kalman filters, image coding using run length coding, DPCM, transform coding and feature analysis. Prep. ECE 3321.

ECE 3506 Digital Image Processing A (2QH)

(formerly 03.9D1)

Fall Quarter

ECE 3506 and ECE 3507 cover the same material with the same prerequisites as ECE 3505, but in two 2QH courses.

ECE 3507 Digital Image Processing B (2QH)

(formerly 03.9D2)

Winter Quarter

Continuation of ECE 3506. Prep. ECE 3506.

ECE 3508 Modern Spectral Analysis (4QH)

Fall Quarter

Introduction; conventional methods of spectrum estimation: periodogram and autocorrelation methods with their smooth versions; the maximum entropy method with and without uncertainty in the correlation measurements; the Levinson algorithm; the minimum energy method, weighted Burg techniques, forward-backward least-squares, covariance least-squares; moving average (MA) and ARMA spectrum estimation; model order selection criteria; harmonic decomposition methods: Prony, Pisarenko and singular value decomposition methods; introduction to multichannel conventional spectrum estimation techniques; parametric modeling of multichannel time series; the Levinson-Wiggins-Robbins algorithm; multichannel AR spectrum estimation techniques. Prep. ECE 3321.

ECE 3509 Modern Spectral Analysis A (2QH)

Fall Quarter

ECE 3509 and 3510 cover the same material with the same prerequisites as ECE 3508, but in two 2 QH courses. Prep. ECE 3321.

ECE 3510 Modern Spectral Analysis B (2QH)

Winter Quarter

Continuation of ECE 3509. Prep. ECE 3509.

ECE 3511 Data Communications Networks (4QH)

(formerly 03.8F6)

Spring Quarter

Elements of computer-communication networks; network topology and design; elements of protocols, routing and network control; queuing and congestion control; description and comparison of several existing computer networks. Prep. ECE 3241.

ECE 3512 Data Communications Networks A (2QH)

(formerly 03.8F4)

Winter Quarter

ECE 3512 and ECE 3513 cover the same material with the same prerequisites as ECE 3511, but in two 2QH courses.

ECE 3513 Data Communications Networks B (2QH)

(formerly 03.8F5)

Spring Quarter

Continuation of ECE 3512. Prep. ECE 3512.

ECE 3514 Error Correcting Codes (4QH)

(formerly 03.9A0)

Spring Quarter

Error correcting codes and their decoding techniques which show promise for applications in digital communication, control and computer systems. Emphasis is placed on the linear block codes based on algebraic structures; cyclic codes for random error correction (B-C-H codes) and burst error correction. Convolutional codes and decoding including the Viterbi algorithm, arithmetic codes. Combination of codes. Coding for ranging and synchronization. Prep. ECE 3211.

ECE 3515 Error Correcting Codes A (2QH)

(formerly 03.9A1)

Winter Quarter

ECE 3515 and ECE 3516 cover the same material with the same prerequisites as ECE 3514, but in two 2QH courses.

ECE 3516 Error Correcting Codes B (2QH)

(formerly 03.9A2)

Spring Quarter

Continuation of ECE 3515. Prep. ECE 3515.

ECE 3517 Information Theory (2QH)

(formerly 03.903)

Spring Quarter

Deals principally with three aspects of information theory; the statistical description of sources and probabilistic measure of their information contents, the determination of channel capacity; and the fundamental coding theorems. Prep. ECE 3241 and ECE 3351.

ECE 3520 Special Topics in Communication Theory (2QH)

(formerly 03.908)

Spring Quarter

Current aspects of communication theory not covered in previous courses. Subject matter may change from year to year. Prep. ECE 3241 and 3351.

ECE 3521 Multidimensional Spectrum Estimation (2QH)

Spring Quarter

Introduction; stationary random fields and their spectrum representation; plane waves and their frequency-wavenumber spectrum; conventional methods (FFT based) and m-d window functions; m-d maximum likelihood method of Capon; 2-d maximum entropy methods; the extendibility problem in spectrum estimation; m-d parametric models for spectrum estimation: separable methods, m-d AR methods, techniques based on minimum variance representations, 2-d ARMA methods; the m-d Prony and Pisarenko methods. Prep. ECE 3503 and 3508.

ECE 3522 Array Signal Processing (2QH)

Spring Quarter

Array systems: configurations, cost, complexity, narrowband and wideband systems; problem formulation; duality between spectrum estimation and array processing; array processing methods: beamforming, minimum variance distortionless, autoregressive, thermal noise, music; coherent vs. incoherent sources; adaptive array processing: sidelobe cancellation, interference rejection, LMS algorithm; wideband array processing techniques; applications to sonar, radar, geophysics and biomedicine. Prep. ECE 3321.

ECE 3523 Communication Systems (4QH)

(formerly 03.870)

Fall Quarter

Primarily concerned with radio communication systems as used in terrestrial and space communication applications. Antenna gain, space loss, cosmic and atmospheric noise, and receiver noise are considered as factors influencing the signal-to-noise ratio in space and satellite repeater systems. Contemporary systems are discussed from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. The theoretical aspects of amplitude and angle modulation systems are introduced and extended to cover multiplex systems; signal-to-noise ratio analysis of frequency multiplex systems; time division multiplex systems. Coverage of digital systems will include sampling, aliasing, and PCM/FM. Bit stream organization for transmission will be considered. A PCM encoder will be discussed as a means of matching the bit stream to the bandwidth. Illustrative examples will be drawn from contemporary communications systems used on balloons, rockets, and satellite repeaters. Prep. ECE 3241 and ECE 3104 or equivalent.

ECE 3524 Communication Systems A (2QH)

(formerly 03.871)

Fall Quarter

ECE 3524 and ECE 3525 cover the same material with the same prerequisites as ECE 3523, but in two 2QH courses.

ECE 3525 Communication Systems B (2QH)

(formerly 03.872)

Winter Quarter

Continuation of ECE 3524. Prep. ECE 3524.

ECE 3527 Nonlinear Systems I (2QH)

(formerly 03.910)

Fall Quarter, As Announced

Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, or a transient. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series. Prep. ECE 3241 and ECE 3221.

ECE 3528 Nonlinear Systems II (2QH)

(formerly 03.911)

Winter Quarter, As Announced

Nonlinear systems with random inputs. Functional representation of the response of a nonlinear system when its input is a random process. Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria. Prep. ECE 3527.

ECE 3529 Nonlinear Systems III (2QH)

(formerly 03.912)

Spring Quarter, As Announced

Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. Prep. ECE 3528.

ECE 3530 Three-Dimensional Picture Processing (2QH)

(formerly 03.887)

Spring Quarter, As Announced

The application of computer, optical, and analytic methods in abstracting geometrical information from pictures. Pictorial presentation of data trains into multidimensional pictures. Methods will be studied for reconstructing three-dimensional objects from two-dimensional pictures. Applications will be in the areas of X-ray analysis, radar target identification, microscopy, and sensory perception. Students will have the chance to pursue individual projects during the term. Prep. ECE 3321.

ECE 3531 Adaptive Signal Processing (4QH)

Fall Quarter

Introduction; Optimum filtering (Wiener-Kalman); Signal and system modeling using linear prediction; Adaptive filtering (FIR, IIR); Fast algorithms for Least Squares adaptive filters; Adaptive array processing; VLSI architectures for adaptive signal processing. Prep. ECE 3321.

ECE 3532 Adaptive Signal Processing A (2QH)

Fall Quarter

ECE 3532 and ECE 3533 cover the same material with the same prerequisites as ECE 3531, but in two 2 QH courses. Prep. ECE 3321.

ECE 3533 Adaptive Signal Processing B (2QH)

Winter Quarter

Continuation of ECE 3532. Prep. ECE 3532.

ECE 3534 Digital Signal Processing of Speech Signals (4QH)

Spring Quarter

This course emphasizes the analysis and recognition of speech using computer techniques. Introduction to speech physiology, linguistics, phonetics, and acoustics. Models of speech production. Short-term processing of speech - temporal features, Fourier analysis, applications. Theory of linear predictive coding and applications. Homomorphic analysis of speech and applications. Speech and speaker recognition. Prep. ECE 3321.

ECE 3535 Digital Signal Processing of Speech Signals A (2QH)

Fall Quarter

ECE 3535 and ECE 3536 cover the same material with the same prerequisites as ECE 3534, but in two 2 QH courses. Prep. ECE 3321.

ECE 3536 Digital Signal Processing of Speech Signals B (2QH)

Winter Quarter

Continuation of ECE 3535. Prep. ECE 3535.

ECE 3537 Multi-User Communication Systems (4QH)

Spring Quarter

Contention-free multiple-access techniques: frequency-division multiple-access (FDMA), time-division multiple-access (TDMA). Spread-spectrum multiple-access (SSMA) communications: Direct-sequence SSMA, frequency-hop SSMA, and hybrid SSMA systems. Communication networks: queuing theory, multiple-access with contention (ALOHA random-access and tree algorithms for random-access), network routing and flow control (quasi-static control versus dynamic control). An overview of the applications of multi-user communication systems: computer-communication networks, broadcast satellite systems, military communications, mobile radio communications, packet-radio communication networks, and fiber-optic local-area networks. Prep. ECE 3351.

ECE 3538 Multi-User Communication Systems A (2QH)

Winter Quarter

ECE 3538 and ECE 3539 cover the same material with the same prerequisites as ECE 3537, but in two 2 QH courses. Prep. ECE 3351

ECE 3539 Multi-User Communication Systems B

Spring Quarter

Continuation of ECE 3538. Prep. ECE 3538.

- ECE 3540 Digital Control Systems (4QH)
(formerly 03.8D6) Spring Quarter
Analysis of linear discrete-time dynamic systems; discretization of continuous systems; sampling and aliasing. Design of digital control systems using transform techniques by discrete equivalent and direct design methods; root locus, Bode and Nyquist diagrams and Nichols charts. Multivariant digital control using state-space methods; pole placement, observer, and regulator design. Controller implementation issues: digital filter realizations, nonlinear effects due to quantization, roundoff, deadband, limit cycles. Selection of the sampling rate. Prep. ECE 3221 and 3381.
- ECE 3541 Digital Control Systems A (2QH)
(formerly 03.8D4) Fall Quarter
ECE 3541 and ECE 3542 cover the same material with the same prerequisites as ECE 3540, but in two 2QH courses.
- ECE 3542 Digital Control Systems B (2QH)
(formerly 03.8D5) Winter Quarter
Continuation of ECE 3541. Prep. ECE 3541.
- ECE 3543 Stochastic Control Theory (4QH)
(formerly 03.965) Fall Quarter
State observer and function observer for deterministic systems; statistical estimation theory, maximum likelihood and mean square error criteria; Kalman filtering; quadratic Gaussian control problem; computer implementation. Prep: ECE 3241 and 3371.
- ECE 3544 Stochastic Control Theory A (2QH)
(formerly 03.963) Fall Quarter
ECE 3544 and ECE 3545 cover the same material with the same prerequisites as ECE 3543, but in two 2QH courses.
- ECE 3545 Stochastic Control Theory B (2QH)
(formerly 03.964) Winter Quarter
Continuation of ECE 3544. Prep. ECE 3544.
- ECE 3560 Acoustics I (2QH)
(formerly 03.817) Fall Quarter
The wave theory of sound. Radiation, reflection, and transmission phenomena. Distributed system analogies, and sound measurements. Prep. ECE 3341.
- ECE 3561 Acoustics II (2QH)
(formerly 03.818) Winter Quarter
Speech and hearing, microphones and loudspeakers, guided waves, room acoustics. Environmental acoustics. Prep. ECE 3560.
- ECE 3562 Acoustics III (2QH)
(formerly 03.819) Spring Quarter
Scattering and diffraction. Effects of viscosity and heat conduction. Finite amplitude and shock waves. Introduction to underwater sound. Prep. ECE 3561.
- ECE 3564 Radar Systems I (2QH)
(formerly 03.865) Fall Quarter
Emphasis on the systems aspects of radar engineering. Topics covered include basic theory of radar detection, measurement of range, angle, and Doppler shift; classes of radar systems; types of radar noise; components of a radar system; matched filters and correlation receivers as applied to radar systems; fundamental ideas of radar system analysis. Prep. ECE 3241.
- ECE 3565 Radar Systems II (2QH)
(formerly 03.866) Winter Quarter
In-depth study of search radar theory; maximum likelihood estimation approach to measurement of radar target parameters; resolution and ambiguity functions applied to radar; radar parameter uncertainty principles. Prep. ECE 3564.

ECE 3566 Radar Systems III (2QH)
(formerly 03.867)

Spring Quarter

Advanced topics in radar systems engineering. Topics to be covered include: design considerations for multistatic radar systems, synthetic aperture radars; tracking systems; radar waveform synthesis; multifunction array radar techniques and selected topics in radar sensing techniques and devices. Prep. ECE 3565.

ECE 3572 Fourier Optics I (2QH)
(formerly 03.916)

Winter Quarter

This two-quarter sequence covers: optical diffraction and imaging problems as linear systems; necessary tools of Fourier analysis and linear systems analysis which occur when solving the scalar wave equation; waves and their properties; reflection, refraction, polarization, and propagation of waves; foundations of scalar diffraction theory -- including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. Prep. ECE 3581.

ECE 3573 Fourier Optics II (2QH)
(formerly 03.917)

Spring Quarter

Continuation of ECE 3572. Prep. ECE 3572.

ECE 3574 Fourier Optics III (2QH)
(formerly 03.983)

Fall Quarter

This course covers current topics of interest in Fourier optics and optical instrumentation. Application of coherence phenomena to optical instrumentation such as microdensitometers, microscopes, viewers, cameras, spectrophotometric and interferometric instruments; applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics and medical application of laser optics. Prep. ECE 3573.

ECE 3576 Lasers I (2QH)
(formerly 03.806)

Fall Quarter

Review of basic optical principles and atomic physics; introduction to optical coherence; models for the interaction of electromagnetic radiation with matter; a general description of lasers is given. Prep. ECE 3341.

ECE 3577 Lasers II (2QH)
(formerly 03.807)

Winter Quarter

Laser threshold and rate equations; elementary resonator theory and fabrication; giant pulse operation; specific solid-state, liquid, and gas lasers; and laser systems. Prep. ECE 3576.

ECE 3578 Lasers III (2QH)
(formerly 03.808)

Spring Quarter

Applications of lasers and laser systems for a variety of engineering and basic science disciplines; specific laser optoelectronic devices. Prep. ECE 3577.

ECE 3579 Optoelectronics and Fiber Optics

Winter Quarter

This course presents an overview and analysis of the various elements and their characteristics which are utilized in optical communication systems. These include elements which generate, transfer, and detect optical signals. Topics include resonance and guiding phenomena, semiconductor physics, LED's, lasers, diode detectors, optical waveguide theory and design, optical communication systems criteria. Prep. ECE 3580.

ECE 3580 Electro-Optics I (2QH)

(formerly 03.914)

Spring Quarter

Survey of the basic concepts necessary for understanding and evaluating the optics involved in electro-optical systems. The optical system as a linear system; matrix methods; diffraction and interference; imaging and aberrations. Prep. Bachelor of Science Degree in Engineering or Physics.

ECE 3581 Electro-Optics II (2QH)

(formerly 03.915)

Fall Quarter

Survey of the basic concepts necessary for understanding electro-optical devices. Wave propagation in isotropic and nonisotropic media; optics of crystals; polarization; optical resonators; guided waves; modulators and detectors; thin film optics. Prep. ECE 3580.

ECE 3583 Optical Properties of Matter I (2QH)

(formerly 03.921)

Fall Quarter

Optics of crystals; classification and effects of crystal symmetry on optical properties; classical description of wave propagation in crystals; applications of the theory to modulation, pulse generation, nonlinear optics. Prep. Bachelor of Science Degree in Engineering or Physics.

ECE 3584 Optical Properties of Matter II (2QH)

(formerly 03.922)

Winter Quarter

Introduction to electro-optical and magneto-optical effects in material media; linear and nonlinear optical materials; elasto-optic and acousto-optical materials; polarization and propagation effects; modulation. Prep. ECE 3583.

ECE 3585 Optical Properties of Matter III (2QH)

(formerly 03.923)

Spring Quarter

Thin films and optical fibers; multilayer filters; dichroics; integrated optics. Prep. ECE 3584.

ECE 3587 Principles of Optical Detection I (2QH)

(formerly 03.981)

Winter Quarter

Laws governing radiation and radiometry; properties of real radiation sources; detailed description of detection devices (image forming and signal generating); noise; contrast and MTF; detection systems (imaging devices and ranging devices); electro-optical detector systems analysis. Prep. Bachelor of Science Degree in Engineering or Physics.

ECE 3588 Principles of Optical Detection II (2QH)

(formerly 03.982)

Spring Quarter

Review of detector parameters; statistics of detector noise; practical considerations in real detectors; detection, resolution and recognition of signals; heterodyne detection and parametric amplification; sub-nanosecond pulse detection calibration of electro-optical detectors; detectors as system components. Prep. ECE 3587.

ECE 3589 Optical Storage and Display (2QH)

(formerly 03.913)

Spring Quarter

Survey of materials and methods for the storage and display of information. Topics included are: photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical crystals, evaporated thin films and liquid crystals. Prep. Bachelor of Science in Engineering or Physics.

ECE 3590 Optical Instrumentation Design (2QH)

(formerly 03.980)

Fall Quarter

An introduction to the design of optical instrumentation. Principles and basic concepts of optical systems. In sequence the topics are: introduction, mechanical shock and vibration, kinematic designs; application of third order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, industrial design, examples and exercises. Prep. Bachelor of Science in Engineering or Physics.

ECE 3591 Spectroscopic Instrumentation (2QH)
(formerly 03.984)

Winter Quarter

Survey of optical instrumentation employed in analysis and control situations; modern methods of spectrometry and interferometry; optimization of analytical systems; topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. Prep. ECE 3581.

ECE 3592 Remote Sensing (2QH)
(formerly 03.886)

Spring Quarter, As Announced

Electromagnetic fundamentals related to passive and active remote sensing of the earth. Geophysical exploration techniques. Radar fundamentals and radar scattering. Instrumentation and data processing. Prep: ECE 3341.

ECE 3593 Plasma Engineering (4QH)
(formerly 03.800)

Fall Quarter, As Announced

The goal of this course is to give an overview on the basic principles and applications of plasma and gaseous discharges. The topics include gas kinetics, interaction of electrons and ions with static and rf fields as well as wave propagation in plasmas. Applications in material processing, space exploration and microwave devices will also be discussed. Prep. ECE 3341.

ECE 3594 Plasma Theory (4QH)
(formerly 03.803)

Winter Quarter, As Announced

Introduction to the basic theory of gaseous discharges. Fluid and kinetic description of collisionless and collisional plasmas with and without magnetic field effects. Emphasis will be placed on linear stability analysis although nonlinear effects will also be discussed. Prep: ECE 3341.

ECE 3595 Plasma Theory A (2QH)
(formerly 03.801)

Winter Quarter, As Announced

ECE 3595 and ECE 3596 cover the same material with the same prerequisites as ECE 3594, but in two 2QH courses.

ECE 3596 Plasma Theory B (2QH)
(formerly 03.802)

Spring Quarter, As Announced

Continuation of ECE 3595. Prep. ECE 3595.

ECE 3600 Microwave Properties of Materials (4QH)

Fall Quarter

This course covers the following topics of interest at high frequencies: General dielectric and magnetic properties of materials; Tensor properties of dielectric and magnetic materials; Special microwave properties of thin film materials; Experimental techniques developed in the characterization of microwave materials. Prep. ECE 3102 and ME 1386 or equivalent.

ECE 3601 Microwave Properties of Materials A (2QH)

Fall Quarter

ECE 3601 and ECE 3602 cover the same materials with the same prerequisites as ECE 3600, but in two 2 QH courses. Prep. ECE 3102 and ME 1386 or equivalent.

ECE 3602 Microwave Properties of Materials B (2QH)

Winter Quarter

Continuation of ECE 3601. Prep. ECE 3601.

ECE 3603 Propagation in Artificial Structures (4QH)

Winter Quarter, As Announced

This course covers the following topics of interest: Effective dielectric and permeability constants in composite materials at high frequencies; Electromagnetic wave propagation in electrical and magnetic anisotropic media; magnetostatic and magneto-elastic wave propagation in single layer; Electromagnetic wave propagation in multi-layers. Prep. ECE 3102 or equivalent.

ECE 3604 Propagation in Artificial Structures A (2QH)

Winter Quarter, As Announced

ECE 3604 and ECE 3605 cover the same material with same prerequisites as ECE 3603, but in two 2 QH courses. Prep. ECE 3102 or equivalent.

ECE 3605 Propagation of Artificial Structures B (2QH)

Spring Quarter, As Announced

Continuation of ECE 3604. Prep. ECE 3604.

ECE 3606 Applications of Plasma Engineering (4QH)

Spring Quarter, As Announced

This course will cover basic operational principles of microwave electron devices, the theory of electric domain formation, free electron and gaseous lasers, particle beam accelerators and radiation sources. Particular topics include both classical microwave devices such as magnetrons, gyrotrons and crossed-field amplifiers, and solid state devices such as Gunn diodes and Impact diodes. Prep. ECE 3593.

ECE 3607 Applications of Plasma Engineering A (2QH)

Winter Quarter, As Announced

ECE 3607 and ECE 3608 cover the same material with the same prerequisites as ECE 3606, but in two 2 QH courses. Prep. ECE 3593

ECE 3608 Applications of Plasma Engineering B (2QH)

Spring Quarter, As Announced

Continuation of ECE 3607. Prep. ECE 3607

ECE 3610 Electronics of Analog Signal Processing (4QH)

(formerly 03.8E3)

Spring Quarter, As Announced

Analog signal acquisition and processing utilizing state of the art devices and circuit techniques such as adaptive filters in sampled data systems, CZTs for spectral analysis, correlated double sampling for improved S/N ratios and solid state imaging systems. Linear and nonlinear processing with MOS, bipolar and CTDs such as CCDs and SAWs. Attention given to analog vs. digital approaches for implementation of similar applications, i.e., bandwidth requirements, throughput, accuracy, cost, etc. Prep. ECE 3331 and ECE 3384.

ECE 3611 Electronics of Analog Signal Processing A (2QH)

(formerly 03.8E1)

Fall Quarter, As Announced

ECE 3611 and ECE 3612 cover the same material with the same prerequisites as ECE 3610, but in two 2QH courses.

ECE 3612 Electronics of Analog Signal Processing B (2QH)

(formerly 03.8E2)

Winter Quarter, As Announced

Continuation of ECE 3611. Prep. ECE 3611.

ECE 3613 UHF and Microwave Devices (4QH)

(formerly 03.8H3)

Spring Quarter, As Announced

Transferred electron devices, parametric devices, microwave transistors such as HEMT's and HBJT's. Equivalent circuit representation using S parameters. Computer-aided design and modeling of devices. Noise characteristics at microwave frequencies. Microwave integrated circuits. Prep. ECE 3341 and 3384.

ECE 3614 UHF and Microwave Devices A (2QH)

(formerly 03.8H1)

Fall Quarter

ECE 3614 and ECE 3615 cover the same material with the same prerequisites as ECE 3613, but in two 2QH courses.

ECE 3615 UHF and Microwave Devices B (2QH)

(formerly 03.8H3)

Winter Quarter

Continuation of ECE 3614. Prep. ECE 3614.

ECE 3616 Active Network Synthesis and Design (4QH)

(formerly 03.845)

Fall Quarter, As Announced

Multiloop feedback techniques are developed and applied to integrated circuit designs such as three-stage Op-Amp realizations and minimum sensitivity amplifiers. Application of these circuits in continuous-time and switched-capacitor filters are treated. Single-active biquadratic filter sections of Sallen and Key and Friend-Delyannis are developed. Multiloop and multiple-active element realizations such as the generalized impedance converter (GIC), frequency-dependent negative resistance (FDNR), follow-the-leader (FLF) and leap-frog (LF) structures are discussed. Design considerations include sensitivity, yield factors, gain-bandwidth product and the approximation problem. MOS switched-capacitor realizations of basic filter structures are developed. Prep. ECE 3331.

ECE 3617 Active Network Synthesis and Design A (2QH)

(formerly 03.843)

Fall Quarter, As Announced

ECE 3617 and ECE 3618 cover the same material with the same prerequisites as ECE 3616, but in two 2QH courses. Prep. ECE 3331.

ECE 3618 Active Network Synthesis and Design B (2QH)

(formerly 03.845)

Winter Quarter, As Announced

Continuation of ECE 3617. Prep. ECE 3617.

ECE 3619 Network Synthesis (4QH)

(formerly 03.832)

Fall Quarter, As Announced

Matrix circuit analysis including m-port parameter systems. Positive-real functions. Energy functions. Driving-point synthesis techniques for LC, RC, and RL networks. Driving-point synthesis of RLC networks. Properties of two-port networks. Two-port synthesis, including the parallel ladder realization. Lattice synthesis. Prep. BSEE or ECE 3100 and ECE 3101.

ECE 3620 Network Synthesis A (2QH)

(formerly 03.831)

Winter Quarter, As Announced

ECE 3620 and ECE 3621 cover the same material with the same prerequisites as ECE 3619, but in two 2QH courses. Prep. ECE 3100 and 3101.

ECE 3621 Network Synthesis B (2QH)

(formerly 03.832)

Spring Quarter, As Announced

Continuation of ECE 3620. Prep. ECE 3620.

ECE 3622 Special Topics in Electronics - Analog MOS LSI Circuits (2QH)

(formerly 03.862)

Spring Quarter

This course covers selected topics of practical importance in the design of analog MOS integrated circuits. Principal topics are: NMOS & CMOS technology and devices; MOS transistor analog switch; digital - analog converters; comparators; analog - digital converters; sampled analog filtering concepts; switched - capacitor filters. Prep. ECE 3331 and ECE 3384.

ECE 3623 Gate Array Design (4QH)

Fall Quarter

This course covers the design, simulation, verification, and implementation of a CMOS gate array. It begins with a description of the VAX based gate array design and logic simulator tools. The students will be given design examples of digital logic circuits which will be entered, verified, and simulated. A description of the GE CMOS Macrocell Circuit Library and an introduction to TEGAS Logic Simulator will be included. After the completion of this course the GE Microelectronics Center, at Research Triangle Park, North Carolina, will fabricate the chosen student gate array design projects which can then be tested and evaluated. Prep. ECE 3331.

ECE 3624 Gate Array Design - A (2QH)

Winter Quarter

ECE 3624 and ECE 3625 cover the same material with the same prerequisites as ECE 3623, but in two 2QH courses.

ECE 3625 Gate Array Design - B (2QH)

Spring Quarter

Continuation of ECE 3624. Prep. ECE 3624.

ECE 3626 Integrated Circuits Fabrication Processes I (4QH)

Winter Quarter

This course presents an overview of, and the principles underlying, the basic techniques and processes employed in the fabrication of modern integrated circuits. Topics covered include crystal growth and epitaxy, oxidation deposition, diffusion and ion implantation, and metalization. A discussion of how these processes are combined to yield the current technologies (bipolar, NMOS, CMOS, MESFET) will be undertaken. Prep. ECE 3101 or equivalent.

ECE 3627 Integrated Circuits Fabrication Processes I-A (2QH)

Winter Quarter

ECE 3627 and ECE 3628 cover the same material with the same prerequisites as ECE 3626, but in two 2 QH courses. Prep. ECE 3101 or equivalent.

ECE 3628 Integrated Circuits Fabrication Processes I-B (2QH)

Spring Quarter

Continuation of ECE 3627. Prep. ECE 3627.

ECE 3629 Integrated Circuit Fabrication Processes II (4QH)

Fall Quarter, As Announced

The goal of this course is to provide the student will knowledge of the state of the art microelectronic fabrication techniques. The advance topics include electron beam, ion beam and x-ray lithographic techniques as well as dry processes which include plasma etching, ion beam processes and reactive ion etching. The concept of gas and plasma kinetics will be introduced. The mechanisms of sputtering and plasma etching will be discussed. Future device development and processing requirements will also be covered. Prep. ECE 3626.

ECE 3630 Integrated Circuit Fabrication Processes II-A (2QH)

Fall Quarter, As Announced

ECE 3630 and ECE 3631 cover the same material with the same prerequisites as ECE 3629, but in two 2 QH courses. Prep. ECE 3626.

ECE 3631 Integrated Circuit Fabrication Processes II-B (2QH)

Winter Quarter, As Announced

Continuation of ECE 3630. Prep. 3630.

ECE 3632 Design and Analysis of Digital Integrated Circuits (4QH)

Winter Quarter, As Announced

The analysis and design of basic digital-integrated-circuit logic families are treated. Bipolar circuits, including advanced-Schottky TTL, emitter-coupled logic (ECL). Double-buffered CMOS and NMOS logic gates, including dynamic logic circuits such as domino logic, are covered. Memory cells and basic cells in logic arrays are treated. Design considerations include propagation delay, switching speed, fan-out and the effect of parasitics. Design techniques are correlated with computer simulations. Prep. ECE 3101 or equivalent.

ECE 3633 Design and Analysis of Digital Integrated Circuits A (2QH)

Winter Quarter, As Announced

ECE 3633 and ECE 3634 cover the same material with the same prerequisites as ECE 3622, but in two 2 QH courses. Prep. ECE 3101 or equivalent.

ECE 3634 Design and Analysis of Digital Integrated Circuits B (2QH)

Spring Quarter, As Announced

Continuation of ECE 3633. Prep. ECE 3633.

ECE 3635 Antennas and Radiation (4QH)

Spring Quarter

Integral equation for the current in the linear antenna: methods of solution; the loop antenna, linear antenna arrays; aperture antennas and lenses; slot antennas and phased arrays; numerical methods in antenna analysis. Prep. ECE 3341.

ECE 3636 Antennas and Radiation A (2QH)

Fall Quarter

ECE 3636 and ECE 3637 cover the same material with the same prerequisites as ECE 3635, but in two 2 QH courses. Prep. ECE 3341.

ECE 3637 Antennas and Radiation B (2QH)

Winter Quarter

Continuation of ECE 3636. Prep. ECE 3636.

ECE 3646 Multivariable Control Systems (4QH)

Fall Quarter

Mathematical preliminaries, polynomial and polynomial matrices; representations of linear multivariable system; matrix fraction description (MFD) and polynomial matrix description (PMD); responses of linear multivariable systems; controllability, observability and canonical forms; poles and zeros of multivariable systems; stability; realization problem; interaction control; state feedback and observer design; compensator design, stability and robustness; noninteraction control; frequency domain design techniques. Prep. ECE 3221 and 3381.

ECE 3647 Multivariable Control Systems A (2QH)

Fall Quarter

ECE 3647 and ECE 3648 cover the same material with the same prerequisites as ECE 3646, but in two 2 QH courses. Prep. ECE 3381.

ECE 3648 Multivariable Control Systems B (2QH)

Winter Quarter

Continuation of ECE 3647. Prep. ECE 3647.

ECE 3797 Engineer Degree Thesis Continuation (0QH)

(formerly 03.923)

Any Quarter

Candidates to sign up for thesis continuation if their thesis is not completed after they have registered for 3 consecutive quarters or 10 QH of EE degree thesis. Continuous registration is required until the candidate graduates.

ECE 3798 Master's Thesis Continuation (0QH)

(formerly 03.9X1)

Any Quarter

ECE 3799 PhD Thesis Continuation (0QH)

(formerly 03.9X4)

Any Quarter

ECE 3860 Master's Thesis (8QH)

(formerly 03.995)

Any Quarter

Analytical and/or experimental work conducted under the auspices of the department. Prep. Bachelor of Science degree in Engineering or Science.

ECE 3861 Master's Thesis (4QH)

Any Quarter

ECE 3862 Master's Thesis (2QH)

Any Quarter

ECE 3870 Engineer Degree Thesis (8QH)

(formerly 03.922)

Any Quarter

Analytical and/or experimental work conducted under the auspices of the department. Minimum of 4 QH, maximum of 8 QH allowed per quarter. Prep. Admission to Engineer Degree Program.

ECE 3871 Engineer Degree Thesis (4QH)

Any Quarter

ECE 3872	Engineer Degree Thesis (2QH)	Any Quarter
ECE 3880	Doctoral Thesis (0QH) (formerly 03.996)	Any Quarter
Theoretical and/or experimental work conducted under the auspices of the department. Prep. Passing of PhD Qualifying Exam.		
ECE 3887	Master's Seminar I (2QH) (formerly 03.990)	Any Quarter
A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lectures. Prep. Bachelor of Science degree in Engineering or Science.		
ECE 3888	Master's Seminar II (2QH) (formerly 03.991)	Any Quarter
The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. Prep. ECE 3887.		
ECE 3889	Doctoral Seminar (0QH) (formerly 03.993)	Any Quarter
This requirement will be satisfied by the student presenting a seminar to the Electrical Engineering Department on a subject related to his/her PhD thesis. The thesis supervisor will coordinate the seminar. Prep. Passing of PhD Qualifying Exam.		
ECE 3892	Doctoral Reading (0QH) (formerly 03.997)	Any Quarter
Material approved by the candidate's advisor. (Only S or F grades will be assigned for this course.) Prep. Passing of PhD Qualifying Exam.		
ECE 3893	Special Problems in Electrical Engineering (2QH) (formerly 03.998)	Any Quarter
Theoretical or experimental work under individual faculty supervision. Prep. Consent of Department Chairman. (4QH equivalent is course ECE 3896)		
ECE 3894	Engineer Degree Reading (4QH) (formerly 03.9Z1)	Any Quarter
To be taken upon completion of 30 QH of satisfactory course work. No credits towards course requirements is given. Minimum of 4 QH, maximum of 8 QH allowed per quarter.		
ECE 3895	Engineer Degree Reading (8QH)	Any Quarter
ECE 3896	Special Problems in Electrical Engineering (4QH)	Any Quarter

BIOMEDICAL

OINT 3250 Engineering and Medicine I (2QH) (formerly 93.901)

Fall Quarter

The intersection of technology with medicine; historical development of bioengineering profession; its impact on society; study of activities embraced by the profession today; educational, training, and career opportunities in clinical, biomedical, and medical Engineering for individuals at the BS, MS, and PhD levels; future goals of engineering in biology and medicine; and issues basic to the relationship between new medical technology and the efficiency and effectiveness of the health care system. Prep. Permission of instructor

OINT 3251 Biomedical Applications of Heat and Mass Transfer (2QH) (formerly 93.911)

Winter Quarter

Bioheat equation; thermal transport in living systems, thermal properties; thermal techniques in the measurement of blood flow; applications of heat transfer in medicine including hyperthermia for cancer therapy, hypothermia for tissue and organ preservation and cryosurgery, thermal sources for implantable artificial heart; and thermography in cancer detection. Prep. Permission of instructor

OINT 3252 Selected Topics in Bioengineering (2QH) (formerly 93.912)

Spring Quarter

Study of biomedical engineering appropriate to topics selected from fields of biomaterials, nuclear medicine, radiation diagnosis and therapy, biological transport processes, artificial organs, rehabilitation engineering, and microprocessor based clinical instruments. Introduction to medical technology assessment. Prep. OINT 3250 or permission of instructor.

**DEPARTMENT OF INDUSTRIAL ENGINEERING
AND INFORMATION SYSTEMS**

The Department of Industrial Engineering and Information Systems offers the following graduate degrees: Master of Science in Industrial Engineering (MSIE); Master of Science in Engineering Management (MSEM); Master of Science in Information Systems (MSIS); Industrial Engineer; and Doctor of Philosophy. Students pursuing a Master of Science in Industrial Engineering or Engineering Management may follow a general program with no concentration or choose one of the following areas of concentration: Computer and Information Systems; Human Factors; Manufacturing Systems; or Operations Research and Reliability Analysis.

The MSIE and MSEM programs may be taken by full-time students on a continuous basis or under the cooperative or sponsorship (intern) plans. These programs may also be pursued on a part-time basis, with courses being offered in the evening.

The MSIS program may be pursued by students who are currently employed in the information systems profession on a part-time or full-time basis, but all other applicants are expected to enroll as full-time students for two quarters and then participate in the graduate cooperative education program by taking a position in information systems for a minimum of six months. During this time, candidates can continue to take courses in the evening graduate program to further meet the degree requirements.

Master of Science Degree Requirements for MSIE and MSEM

A minimum of forty quarter hours of graduate level credit is required for any of the Master of Science programs in the Industrial Engineering and Information Systems Department, including up to six quarter hours of prerequisite or advanced undergraduate courses as electives.

Up to six quarter hours may be elected in other graduate schools with the approval of the student's faculty advisor and the Director of the graduate school offering the desired course. The amount of credit applied toward the degree will be established by the student's advisor.

It is expected that students entering the MSIE and MSEM programs have an adequate background in the following areas: Engineering Economy; Operations Research; Probability and Statistics; Human Factors (Industrial Engineering only); and Computer Programming. If the admissions committee concludes that a student has not had sufficient preparation in these areas, they may specify prerequisite courses as part of the degree requirements. No more than six quarter hours of this prerequisite work can be applied as electives towards the required 40 hours of graduate work for the Master of Science degree.

Elective Courses

Any non-prerequisite course can be taken as an elective. In the IE/IS Department all prerequisite courses begin with 31XX, (with the exception of IIS 3600 in the MSIS program).

MSIE & MSEM Prereq. Courses (primarily for non-IE degree holders) Credits

IIS 3102	Introduction to Human Factors Engineering.....	2
IIS 3103	Basic Operations Research.....	4
IIS 3113	Basic Probability and Statistics.....	4
IIS 3100	Basic Engineering Economy.....	2
IIS 3101	Industrial Accounting for Engineers.....	2
Higher Level Language (a structured language is required for the C&IS concentration, e.g. IIS 3106, IIS 3115 or IIS 3117)		

Master of Science in Information Systems

The program consists of courses which help students develop both management and information skills. The former category includes courses such as Planning and Managing IS Development, Accounting, and Management Science, while the latter covers topics such as Computer Technology, Data Base Management, Operating Systems, and Software Design. The prerequisite set of courses (totaling 22 or 24 credits) will be required for students, or waived, depending on their particular academic background and undergraduate experience. It is expected that students beginning this program will have an adequate background in the following areas: calculus, probability, accounting, and programming languages (including COBOL and an Assembly Language).

Based upon the recommendation of the Graduate School and the advisor, a student may be required to take all or some of the following prerequisite courses. However, no more than six hours of graduate credit from the prerequisite courses can be applied to the minimum degree requirements of forty quarter hours. Students must obtain advisor approval for selection of C&IS and other electives.

<u>Prerequisite Courses</u>	<u>Credits</u>
MTS 3211, 3212, 3213 Elements of Math for Info Sys I, II, II.....	2 each
IIS 3101 Industrial Accounting for Engineers.....	2
IIS 3111 Principles of COBOL.....	2
IIS 3112 Quantitative Methods for Information Systems.....	4
IIS 3113 Basic Probability & Statistics.....	4
IIS 3106 Elements of Structured Programming.....	2
Either	
IIS 3600 Basic Computer Systems Technology.....	2
Or	
IIS 3116 Assembly Language.....	4

Course Requirements

Core Courses.....	24 QH
MSIS Elective Courses.....	8 QH
Open Electives.....	8 QH
Minimum Quarter Hours Required*.....	40 QH
*include maximum of 6 QH of prerequisite courses	

MSIS Core Courses-24 QH

IIS 3504 Data Structures & Intro to Data Base Mgt.....	4
IIS 3507 Operating Systems & Systems Software.....	4
IIS 3510 Computer Architecture.....	4
IIS 3615 Analysis and Design of Computer Info Sys.....	4
IIS 3622 IS in a Microcomputer Environment.....	4
IIS 3628 Data Base Management Systems.....	4

MSIS Elective Course-Select 8 QH

IIS 3307 Introduction to Microprocessors.....	2
IIS 3308 Microcomputer Applications.....	2
IIS 3218 Planning and Management Information Systems Development.....	4
IIS 3623 File Processing.....	2
IIS 3624 Software Engineering I.....	4
IIS 3626 Networks and Telecommunications.....	4

Master of Science in Industrial Engineering

The MSIE degree requires either an eight quarter hour thesis or a four quarter hour special project. Arrangements for and approval of the topic for the special project or thesis must be made with a member of the full-time faculty of the department. All MSIE students will take the core courses shown below. Equivalent substitutions must be approved by a petition.

	<u>With Thesis</u>	<u>With Project</u>
Core Courses.....	20 QH	20 QH
Electives.....	12 QH	16 QH
Thesis or Project.....	8 QH	4 QH
Minimum Quarter Hours Required.....	40 QH	40 QH

<u>Required Core Courses</u>	<u>Credits</u>
IIS 3304 Production Analysis.....	4
IIS 3503 Simulation Methodology and Applications.....	4
IIS 3514 Advanced Operations Research.....	4
IIS 3522 Systems Engineering Design and Analysis.....	4
IIS 3523 Applied Statistics.....	4

The remaining coursework is satisfied by elective courses. A student may opt for a concentration in Computers and Information Systems, Human Factors, Manufacturing Systems, or Operations Research and Reliability Analysis by taking the required courses for the elective concentration.

Master of Science in Engineering Management

The core course requirements for the Engineering Management program are listed below:

Core Courses.....	24 QH
Electives.....	16 QH
Minimum Quarter Hours Required.....	40 QH

<u>Required Core Courses</u>	<u>Credits</u>
IIS 3204 Engineering/Organizational Psychology.....	4
IIS 3207 Financial Management.....	4
IIS 3217 Engineering Project Management.....	4
IIS 3503 Simulation Methodology and Applications.....	4
IIS 3523 Applied Statistics.....	4
IIS 3615 Analysis and Design of Computer Information Systems.....	4

The remaining coursework is satisfied by elective courses. A student may opt for a concentration in Computers and Information Systems, Human Factors, Manufacturing Systems, or Operations Research and Reliability Analysis by taking the required courses for the elective concentration.

Required Courses for Elective Concentrations

<u>Computer and Information Systems-8 QH</u>		Credits
IIS 3604	Data Structures and Introduction to Data Base Mgt.....	4
IIS 3628	Data Base Management Systems.....	4
<u>Manufacturing Systems-8 QH</u>		
IIS 3309	Computer Methods in Manufacturing.....	4
IIS 3310	Manufacturing Methods and Processes.....	4
IIS 3311	Computer-Aided Manufacturing.....	4
<u>Operations Research and Reliability Analysis-8QH</u>		
IIS 3514	Advanced Operations Research (for MSEM only).....	4
Either		
IIS 3524	Advanced Operations Research Topics.....	4
Or		
IIS 3525	Intro to Reliability Analysis & Risk Assessment.....	4
<u>Human Factors-12 QH</u>		
IIS 3400	Human Factors Engineering.....	4
IIS 3410	Advanced Human Factors Engineering.....	4
IIS 3509	Design of Experiments.....	4

The Industrial Engineer Degree

This degree is designed for those who wish to undertake graduate study beyond the Master of Science degree which is less extensive and more applied than that required for the doctorate. The program leading to the Industrial Engineer degree permits a candidate to pursue a course of study at the upper graduate level which will help the student develop in-depth knowledge in selected Industrial Engineering techniques, and the ability to apply these techniques to complex problems in a real-world setting. The candidate will work closely with a faculty advisor throughout the program.

Qualifications, Degree Candidacy, and Examinations

Upon acceptance, a student is classified as a degree candidate. A 3.00 grade point average must be maintained in order to qualify for the degree. A final oral examination for defense of the written report of the Industrial Engineer degree project conducted by the student's project committee is also a requirement for the degree.

Course Requirements

A minimum of 40 quarter hours beyond the Master of Science degree is required. Normally ten quarter hours of credit out of the 40 will be granted for work on the Industrial Engineering degree project. A minimum of 20 quarter hours must be taken in Industrial Engineering.

Language Requirements

There is no language requirement for the Industrial Engineer degree.

Residence Requirement

Since the Industrial Engineer degree project requires the structuring and solving of a complex problem, residence requirements will be satisfied by an arrangement, approved by the advisor, which allows the student to devote a sufficient portion of his or her time to the project to permit an intensive problem-solving experience.

Engineer Degree Project

To be awarded the degree of Industrial Engineer, the candidate must complete, in addition to the required course work, a project demonstrating a high level of competence in structuring and solving a complex real-world problem. The problem addressed in this project is of an applied nature. Where applicable, an on-going organization will be used as the setting. The work should lead to a solution which satisfies all technological and organizational constraints, and is therefore capable of being implemented. The topic will be selected by the student and the faculty advisor. Normally, a project committee of three faculty members will be appointed.

The Doctor of Philosophy Degree

The Doctoral Program in IE/IS requires the successful completion of the following five-step procedure: (i) admission, (ii) research and course preparation, (iii) the doctoral qualifying exam, (iv) the doctoral thesis, and (v) the doctoral defense.

I. Admission

Prospective candidates are required to have completed the equivalent of an M.S. program in Industrial Engineering, or a related engineering/scientific field. A minimum of 3.40 grade point average out of 4.0 over the course of the applicant's graduate career is required. Acceptably strong letters of recommendation from two or more faculty familiar with the applicant's capability for graduate study must also be provided.

II. Research and Course Preparation

Upon admission, the student will complete a research project, if he/she has not completed a master's level research thesis. All graduate course requirements must also be met for the particular research concentration (viz., Operations Research and Reliability Analysis, Manufacturing Systems, Human Factors, or Computer and Information Systems) before the student can take the doctoral qualifying examination.

III. Doctoral Qualifying Examination

The doctoral qualifying examination is administered by the department in Fall and Spring Quarters. It is a two part examination. A four-hour written examination covers both the core curriculum of the department and the student's chosen area of research specialization. This is followed by a one and one-half hour oral examination in the research specialization. Upon passing, the student becomes a doctoral candidate.

IV. Doctoral Thesis

The doctoral thesis consists of a research effort spanning 1 to 3 years. It must be original, advanced work that makes a significant contribution to the candidate's field of research. The candidate's thesis committee who will review the written report will be chaired by a full-time IE/IS faculty advisor. It must consist of at least three persons, of whom at least two are full-time IE/IS faculty members.

V. Doctoral Defense

The doctoral defense consists of a two-hour presentation and question/answer period in which the candidate presents and defends his/her doctoral research work. The defense will be attended by the candidate's doctoral thesis committee and other interested members of the university community. Determination of adequate defense of the work will be made by the committee.

Faculty
Thomas P. Cullinane, Chairman

Professors

Cullinane, Thomas P., PhD, Virginia Polytechnic and State University; manufacturing systems, facilities planning, industrial hygiene
Freeman, David R., PhD, Stanford University; engineering economy, computer-aided manufacturing
Mourant, Ronald R., PhD, Ohio State University; simulation, human-computer interaction
Rule, Wilfred P., MS, MIT; management information systems

Associate Professors

Brown, Franklyn K., MEd, Northeastern University; engineering graphics
Gupta, Surendra M., PhD, Purdue University; simulation, operations research, production systems
Heising, Carolyn D., PhD, Stanford University; reliability analysis, probabilistic risk assessment
Hoover, Stewart V., PhD, University of Oklahoma; simulation, management information systems
Kokar, Mieczyslaw, PhD, Technical University of Wroclaw; artificial intelligence, operating systems
Lang, Robert S., MEd, Boston University; engineering graphics
Melachrinoudis, Emanuel S., PhD, University of Massachusetts; operations research, manufacturing systems
Perry, Ronald F., PhD, University of Michigan; management information systems, simulation
Woodard, Kenneth S., M Eng, Boston University, engineering graphics

Assistant Professors

Gardiner, Martin F., PhD, UCLA; management information systems, decision support systems
Goldman, David S., MS, Northeastern University; manufacturing systems, operations research, occupational safety and health
Kung, Henry K., PhD, Oklahoma State University; CAD/CAM, expert systems, simulation
Rumpf, David L., PhD, University of Massachusetts; statistics, operations research, management information systems
Voland, Gerard G.S., MS, UCLA; engineering design, control theory, rehabilitation engineering

Advisors

MSIE & MSEM

General
Computer and Information Systems
Operations Research &
Reliability Analysis
Human Factors
Manufacturing Systems
MSIS
Software Engineering

Prof. Cullinane, Prof. Gupta, Prof. Rule
Prof. Genadis, Prof. Mourant
Prof. Gupta, Prof. Heising, Prof. Melachrinoudis

Prof. Gardiner,
Prof. Gupta, Prof. Kung
Prof. Perry
Prof. Kokar, Prof. Mourant

INDUSTRIAL ENGINEERING

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time.

IIS 3100 Basic Engineering Economy (2QH) (formerly 05.808)

Fall and Winter Quarters

Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques using discrete compound interest calculations. Prep Bachelor of Science degree in Engineering or Science.

IIS 3101 Industrial Accounting for Engineers (2QH) (formerly 05.810)

Fall, Winter, and Spring Quarters

Introduction to basic accounting principles and procedures; use of accounting data as a management tool; a practical covering of basic cost accounting procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems.

IIS 3102 Introduction to Human Factors Engineering (2QH) (formerly 05.851)

Fall and Winter Quarters

A survey of the principal topics and areas of concentration in the field. Includes introductory concepts of sensory physiology and sensory performance; basic motor capabilities and limitations; concepts of the human as a processor of information; and methods of gathering human performance data. Normally the first course in the human factors areas for students without behavioral science background. Prep. IIS 3113 or permission of instructor.

IIS 3103 Basic Operations Research (4QH)

Winter and Spring Quarters

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines, and Markov Chains. Prep. IIS 3113.

IIS 3106 Elements of Structured Programming (2QH) (formerly 05.920)

Fall, Winter, and Spring Quarters

An introductory course to the principles and techniques of top down structures programming. The host language is PASCAL and topics covered include assignment statements, logical expressions, control statements, data structures, recursion and pointers. Prep. Admission to Graduate Program.

IIS 3111 Principles of COBOL (2QH) (formerly 05.939)

Fall and Winter Quarters

Fundamentals of computer programming in COBOL. Topics include elementary computer functioning, program organization, input/output operations, arithmetic and data-handling verbs, and program logic development through the use of flow charts. Storage and manipulation of large data files on magnetic tape are introduced. No prior computer experience is required. Prep. Admission to Graduate School.

IIS 3112 Quantitative Methods for Information Systems (4QH)

Fall and Winter Quarters

An introduction to the theory and use of deterministic and stochastic models in the context of computer and information systems. Models included are linear programming, dynamic programming, Monte Carlo simulation, Gant and Pert charts, multicriteria decision analysis and waiting lines. Class examples will emphasize applications in a computer and information systems environment. Prep. IIS 3113.

IIS 3113 Basic Probability and Statistics (4QH)

Fall, Winter and Spring Quarters

Fundamental concepts of probability. Events, sample space, discrete and continuous random variables. Density functions, mass functions, cumulative probability distributions and moment generating functions. Expectation of random variables. Common discrete and continuous probability distributions including binomial, poisson, geometric, uniform, exponential and normal. Multivariate probability distributions, covariance and independence of random variables. Sampling and descriptive statistics. Parameter estimation, confidence intervals and hypothesis testing. Prep. Admission to Graduate Program.

IIS 3115 Modula-2 for Engineers (4QH)

Fall Quarter

The objectives of the course include: methods for solving problems on the computer, knowledge of the basic hardware/software of a computer system and proficiency in a high level programming language (Modula-2). The building blocks of Modula-2: data types, variable and constant declarations; enumerations, arrays, sets, records, and pointers; input/output library functions. The control structures of Modula-2: procedures, modules and visibility control. Also covered are sequential and screen-oriented input/output; recursion, concurrency and low-level facilities; software design using structured charts. Prep. Admission to Graduate Program.

IIS 3116 Assembly Language (4QH)

Fall Quarter

The study of computer programming in an assembly language with emphasis on structured programming techniques, interrupt service routines, and input/output device drivers. Topics will also include elements of a mini/micro-computer system architecture, system resources, interrupts input/output interfaces, processor's instruction set and addressing modes. Students will use an assembler and a debugger on a computer system selected by the instructor to write and run assembly language programs. Possible computers to be used include the VAX family of mini-computers and 8088 and 80286-based micro-computers. Prep. Higher level language.

IIS 3117 Intensive Modula-2 (2QH)

Winter Quarter

Programming in Modula-2 for students who know another structured high-level language. Syntax and basic data and control structures: modules, procedures and visibility control; and overview of enumerations, arrays, records, sets and pointers. Basic input/output library functions; sequential and screen-oriented input/output. Recursion, concurrency and low-level facilities in Modula-2. Software design using structured charts.

IIS 3200 Organizational Perspectives and Project Management (4QH)

Spring Quarter

A survey of business organization, management and operation, including business responsibility to its employees, its product, the customer and the environment in which it operates. Planning, forecasting, and budgeting; the financial markets; investing and speculating will be covered, as well as the interaction of politics, government and government controls on the industrial enterprise. Prep. Admission to Graduate Program.

IIS 3201 Analysis of the Industrial Enterprise I (2QH)

Fall Quarter

IIS 3201 and IIS 3202 cover the same material as IIS 3200, but in two 2QH courses.

IIS 3202 Analysis of the Industrial Enterprise II (2QH)

Winter Quarter

IIS 3201 and IIS 3202 cover the same material as IIS 3200, but in two 2QH courses. Prep. IIS 3201.

IIS 3204 Engineering/Organizational Psychology (4QH)

Fall Quarter

An analysis of the purpose and functioning of organizations as the basic networks for achieving goals through coordination of effort, communication, and responsibility. The approach will emphasize the role and function of engineering organizations and will be based on modern behavioral science concepts. The course covers the application of psychology to industry relative to human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. Prep. Admission to Graduate Program.

IIS 3205 Industrial Organizations (2QH)

Winter Quarter

IIS 3205 and IIS 3206 cover the same material as IIS 3204, but in two 2QH courses.

IIS 3206 Industrial Psychology for Engineers (2QH)

Spring Quarter

IIS 3205 and IIS 3206 cover the same material as IIS 3204, but in two 2QH courses. Prep. 3205.

IIS 3207 Financial Management for Engineers (4QH)

Fall and Winter Quarters

Study of the issues and processes of short-term financing on industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. Also covered is the analysis necessary for such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. Prep. IIS 3101 or IIS 3114 and IIS 3201 or equivalent.

IIS 3208 Financial Management I (2QH)

Fall Quarter

IIS 3208 and IIS 3209 cover the same material, with the same prerequisites, as IIS 3207, but in two 2QH courses.

IIS 3209 Financial Management II (2QH)

Winter Quarter

IIS 3208 and IIS 3209 cover the same material as IIS 3207, but in two 2QH courses. Prep. 3208.

IIS 3214 Engineering Communication (2QH)
(formerly 05.813)

Spring Quarter

Exploration of practice in the preparation and presentation, both written and oral, of the results of engineering projects and programs as a basis for business decisions: including formal reports, progress summaries, memoranda, and technical papers. The effective use of various media and audiovisual aids based on both audience and material. Prep. Admission to Graduate Program.

IIS 3216 Advanced Engineering Economy (2QH)
(formerly 05.809)

Winter Quarter

Principal emphasis on the practical application of the techniques studied in basic engineering economy; problems of implementation through class discussion of cases and student projects; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. Prep. IIS 3114.

IIS 3217 Engineering Project Management (4QH)

Winter and Spring Quarters

The optimization of schedules utilizing pertinent software tools such as the linear programming and project management packages will be undertaken. Other graphics software used to draw project diagrams such as Gantt charts, PERT diagrams, manpower loading charts and funding charts will be included. Determination of the critical path and comparison of actual performance with the planned schedule will be covered. The systems life cycle will be considered. Needs analysis, requirements definition, preliminary design, detailed design and implementation will be addressed in the context of project management. Prep. Admission to Graduate Program.

IIS 3218 Planning and Managing Information Systems Development (4QH)

Spring Quarter

The computer system development life cycle. Interactions between the system and the organization. Design parameters and tradeoffs. Planning for externalities. Individual and organizational aspects of human decision making. Systems approach to planning, management and control of effective information systems development. The course will be based on extensive use of case studies and will include some guest speakers. IIS 3617 and IIS 3618 cover the same material as IIS 3218, but in two 2QH courses. Prep. IIS 3615.

IIS 3219 Cost Accounting and Industrial Budgeting (4QH)

Fall and Spring Quarters

Cost accounting procedures are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals and for input into various budgeting plans which the engineer may become involved with. An introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital and cost-volume profit analysis will be provided. Prep. IIS 3101.

IIS 3220 Development of Engineering Personnel (4QH)

Fall Quarter

The science and art of managing creative people employed in research, developmental, and engineering activities are considered with a view to understanding the problems encountered by such people and their managers in the course of their professional work. Attention is devoted to behavioral theories and their applications in the practice of management. Emphasis is placed on each student's own experiences as professionals or managers in diverse industrial settings. Prep. Admission to Graduate Program.

IIS 3302 Advanced Work Design (2QH)

(formerly 05.817)

Spring Quarter

Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models; repetitive and nonrepetitive work models, and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches; emphasis on development of professional, analytical, and managerial skills and abilities at a systems level. Prep. Bachelor of Science degree in Engineering or Science.

IIS 3303 Product Design and Value Analysis (2QH)

(formerly 05.822)

Winter Quarter

Study of design parameters and their effect on development, manufacturing and procurement; functional analysis of components and systems; complete projects and case studies are integrated in the course. Prep. Bachelor of Science degree in Engineering or Science.

IIS 3304 Production Analysis (4QH)

(formerly 05.823)

Fall Quarter

Modern quantitative techniques of production planning and control considering deterministic and probabilistic models are presented. Topics include project planning, forecasting, aggregate planning and master scheduling, inventory analysis and control, materials requirement planning, job shop scheduling and dispatching problems. Prep. IIS 3103 and IIS 3113.

IIS 3305 Case Studies in Industrial Engineering (2QH)

(formerly 05.824)

Spring Quarter

Formulation of problems and analysis of situations on topics such as work measurement, line balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Class discussion and written analysis of a variety of cases is included. Prep. IIS 3304.

IIS 3306 Network Planning and Control (2QH)

(formerly 05.912)

Spring Quarter

Applications of stochastic networks to project management, scheduling, inventory, reliability, quality control and other industrial applications; review of PERT and its inadequacies to the development of stochastic flow-graphs and networks; solving for the mean task times and variances using moment-generating functions; setting up the model for computer simulation using GERT. Prep. IIS 3506 or IIS 3523.

IIS 3307 Introduction to Microprocessors(2QH)

(formerly 05.971)

Winter Quarter

First course in advanced microprocessor systems introducing basic concepts of system architecture, interfaces and programming using modern 16- and 32-bit microprocessor families. CPU programming model, instruction set, addressing modes and exception processing. Privilege states, memory management, bus control. Principles of assembly language programming. Two microprocessor families: MC68000 and iAPX86. Prep. Structured higher level language.

IIS 3308 Microcomputer Applications (2QH)

(formerly 05.972)

Spring Quarter

Introductory course on microcomputer applications in local networks. Multi-microcomputersystems, bus topology interconnection, communication architecture and protocols. Microcomputer-based local network nodes, local network model and protocol development examples. Token bus and collision detection protocols. Prep. Structured higher level language and IIS 3307 or equivalent.

IIS 3309 Computer Methods in Manufacturing (4QH)

(formerly 05.974)

Fall Quarter

In depth coverage of the use of computers in selected areas of manufacturing systems design is presented. Possible topic areas are numerical control, MRP, process planning and control, and other important applications of computers to manufacturing systems. Prep. IIS 3311 or permission.

IIS 3310 Manufacturing Methods and Processes (4QH)

(formerly 05.975)

Spring Quarter

Material covered includes the structures of polymers (thermoplastic, thermosetting and glasses). Manufacturing processes for polymers including thermoforming are included. Structure of metals, the manufacturing processes for metal forming are presented. Alloys and welding and brazing are also included. Prep. Bachelor of Science degree in Engineering or Science.

IIS 3311 Computer-Aided Manufacturing (4QH)

(formerly 05.980)

Spring Quarter

A first course (overview) of computer aided manufacturing. Covers of the areas that encompass the term CAM, i.e., are group technology, material requirements planning, part coding and classification, numerical control, part programming and management systems. Broad coverage of each of the areas is given to allow the student to gain an appreciation of the coming review of the automated factory. Prep. Higher level language.

IIS 3312 Forecasting and Inventory Control (4QH)

Winter Quarter

Econometric methods of forecasting the demand for industrial products; emphasis on techniques applicable to individual companies and the total demand. The principal tool used is the mathematical model of the causal factors with special attention to determining the reliability of the model. The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models and techniques, production planning and control models and methods. Prep. IIS 3523.

IIS 3400 Human Factors Engineering (4QH)

Winter Quarter

The course covers sensory motor and work environment considerations. Topics include the design of equipment and systems for human use, with the application of engineering psychology; visual and auditory presentation of information; human information processing and skilled task performance. The course examines the human as a work-performing, heat generating physiological engine, and the implied restrictions on the equipment and work place to provide occupational safety and effective man/machine performance. Prep. IIS 3102.

IIS 3401 Human Factors - Sensory Motor (2QH)

Winter Quarter

IIS 3401 and IIS 3402 cover the same material, with the same prerequisites, as IIS 3400, but in two 2QH courses.

IIS 3402 Human Factors - Work Environment (2QH)

Spring Quarter

IIS 3401 and IIS 3402 cover the same material as IIS 3400, but in two 2QH courses.

IIS 3403 Occupational Health and Safety (4QH)

Winter Quarter

Topics include safety responsibilities of management and employees; recognition of chemical, electrical, and mechanical hazards; principles of machine guarding; accident investigation and cost analysis; record keeping requirements under OSHA Act of 1970; safety programs and inspections; safety training; toxicology, first aid and medical services; fire prevention and control methods; occupational diseases and personnel protective equipment. Prep. Admission to Graduate Program.

IIS 3404 Introduction to Occupational Health and Safety (2QH)

Winter Quarter

IIS 3404 and IIS 3405 cover the same material as IIS 3403, but in two 2QH courses.

IIS 3405 Technical Aspects of Health and Safety (2QH)

Spring Quarter

IIS 3404 and IIS 3405 cover the same material as IIS 3403, but in two 2QH courses. Prep. IIS 3404.

IIS 3406 Man-Computer Interaction (2QH) (formerly 05.853)

Spring Quarter

Design and evaluation of the man-computer interface in on-line information systems; formatting of visual displays and auditory outputs, techniques to facilitate operator inputs, pacing and control of the interactive sequence, operator training, task analysis and performance testing. Student projects in areas of novel application. Prep. IIS 3401.

IIS 3407 Human Factors Engineering - Data Base (2QH)

Winter Quarter

IIS 3407 and IIS 3408 cover the same material, with the same prerequisites, as IIS 3410, but in two 2QH courses.

IIS 3408 Human Factors Engineering - Application Methods (2QH) (formerly 05.855)

Spring Quarter

IIS 3407 and IIS 3408 cover the same material as IIS 3410, but in two 2QH courses. Prep. IIS 3102.

IIS 3409 Topics in Physiology and Biomedical Engineering (2QH)
(formerly 05.864)

Spring Quarter

Introduction to specific areas relating to human structure and function, and to the use of engineering techniques for medical diagnosis and therapy. Areas considered include blood and blood components, the cardiovascular system, the kidney and urinary systems and respiratory systems. The course will be taught on a seminar basis. Students will be required to do literature research under the guidance of the instructor. Prep. Permission of instructor.

IIS 3410 Advanced Human Factors Engineering (4QH)

Winter Quarter

The study of methods and techniques used to obtain and interpret human performance data. Includes examination of experimental methods and problems peculiar to experimentation with human subjects; unobtrusive measures, and non-reactive techniques; survey design and implementation; systematic observation techniques. Also covered are systems analysis and man/machine systems; function and task analysis; task allocation; support equipment and training design; error analysis; occupational safety; preconstruction; periodic and accident/critical incident analytic techniques. Prep. IIS 3509 and IIS 3400.

IIS 3503 Simulation Methodology and Applications (4QH)

Winter and Spring Quarters

Course covers when, where and how to use discrete event simulation techniques. Topics include model design, development and validation; tactical and strategic planning considerations in the use of the model; input data reduction; alternative programming languages for implementing models; efficiency in running simulations, and statistical reliability in the design and analysis of simulation experiments. Several special purpose simulation languages are discussed, e.g. SIMSCRIPT, GPSS, and SIMON. Prep. IIS 3506 or IIS 3523 and higher level language.

IIS 3509 Design of Experiments (4QH)

Fall Quarter

Theory and application of experimental design techniques such as modeling and statistics which can optimize resources and improve decision making risks. This course will cover experiments with single and multiple factors of interest and consider experiments with high order experimental restrictions. Some additional analysis techniques will also be covered. Prep. IIS 3523.

IIS 3510 Design of Experiments I (2QH)

Fall Quarter

IIS 3510 and IIS 3511 cover the same material, with the same prerequisite, as IIS 3509, but two 2QH courses.

IIS 3511 Design of Experiments II (2QH)

Winter Quarter

IIS 3510 and IIS 3511 cover the same material as IIS 3509, but in two 2QH courses. Prep. IIS 3510

IIS 3512 Queuing Theory and Its Applications (2QH)
(formerly 05.904)

Spring Quarter

A development of the theory of queues with emphasis on practical applications, using the latest techniques of Markovian state-transition diagrams to simplify the mathematic model; study of models based on random arrivals and departures including exponential and Erlang service distributions, single and multiple services, series and parallel systems, finite and infinite queues; applications to staffing, inventory control, reliability, maintenance and scheduling. Prep. IIS 3103.

IIS 3514 Advanced Operations Research (4QH)

(formerly 05.914)

Winter Quarter

Important families of mathematical programming problems and optimization methods will be covered. Generalized networks including the transshipment, shortest route, maximal flow and the minimal spanning tree problems. The cutting plane and the branch and bound algorithm for binary and mixed integer programming problems. Introduction to nonlinear programming including unconstrained optimization, the Kuhn-Tucker conditions, gradient methods, separable, quadratic and geometric programming. Prep. IIS 3103.

IIS 3517 Statistical Decision Theory (2QH)

(formerly 05.953)

Winter Quarter

Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to game theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. Prep. IIS 3506 and IIS 3523.

IIS 3518 Advanced Quality Control (2QH)

(formerly 05.954)

Fall Quarter

Mathematical methods of quality control; development of the process control charts for sampling by variables and by attributes; development of acceptance test procedures; development of life-testing plans; cost aspects of quality-control decisions. Prep. IIS 3506 and IIS 3523.

IIS 3522 Systems Engineering Design and Analysis (4QH)

Spring Quarter

The course covers principles of systems modeling and analysis using continuous simulation techniques. Topics include differential equations as system models; Laplace transformations; numerical approximation techniques; stability; steady-state error; control actions; alternative modeling schemes; and validation of system models via continuous simulation techniques. Prep. Higher level language.

IIS 3523 Applied Statistics (4QH)

Fall and Spring Quarters

Development of complete statistical models for the predication and analysis of random phenomena. Topics include: Goodness of fit and nonparametric tests. Analysis of variance. Simple and multiple regression. Introduction to the design of experiments, quality control, decision analysis, reliability and risk assessment. Prep. IIS 3113.

IIS 3524 Advanced Operations Research Topics (4QH)

Spring Quarter

Topics will include the revised simplex algorithm, parametric linear programming and the decomposition principle for large size multidivisional problems. Introduction to multi-criteria decision analysis, including the generation of the nondominated solution set, goal programming, evaluation of nondominated solutions and multi-criteria optimization applications. Prep. IIS 3103.

IIS 3525 Introduction to Reliability Analysis and Risk Assessment (4QH)

Winter Quarter

Introduction to probability theory, classical and Bayesian statistics useful for reliability analysis of large, complex systems. The course covers Bayesian probability encoding of experience data; principles of the methods of risk assessment and reliability analysis including fault trees, decision trees, and reliability block diagrams. Practical applications to industrial operations, e.g., nuclear and chemical plants, military systems, large processing plants, are treated. Prep. Admission to Graduate Program.

IIS 3526 Advanced Reliability Analysis, Risk Assessment, and Maintenance (4QH)

Spring Quarter

Extended application and use of reliability and probabilistic risk analysis methods. Methods for common cause/dependent failure analysis, human reliability analysis, and treatment of uncertainties. Bayesian statistics applied to data analysis and discrete probability distribution (DPD) arithmetic for propagation of uncertainty. Time dependent reliability analysis, Markov models, availability, and maintenance theory. Replacement and maintenance strategy development. The role of maintenance in improving systems reliability, performance, and productivity. The Deming method of quality control. Case studies in industrial system. Prep. IIS 3525.

IIS 3600 Basic Computer Systems Technology (2QH)

(formerly 05.930)

Fall, Winter and Spring Quarters

Introduction to computer systems and assembly language programming using a microcomputer or minicomputer. Topics include machine language and assemblers, input/output device control. Students are required to prepare and test several programs. Prep. Higher level language.

IIS 3601 Compiler Design (4QH)

Winter Quarter

An introduction to data structures including stacks and trees. The nature of compiling and interpreting, string manipulation and code generation. The writing of a compiler in assembly language of a BASIC-like source language will be started. The compiler design work is completed as a term project. Prep. IIS 3600 or IIS 3116.

IIS 3604 Data Structures and Data Base Management (4QH)

Fall and Winter Quarters

Topics include arrays, stacks, lists, linked lists, queues, trees, graphs, symbol tables and files. A model of each data structure is presented and various implementations in a high level language are discussed. Algorithms for handling data are analyzed. Applications of particular structures are shown in order to emphasize the role of abstraction in problem solving with computers. Searching and sorting techniques are also covered. Prep. IIS 3106 or IIS 3115 or IIS 3117.

IIS 3607 Operating Systems and Systems Software (4QH)

Winter and Spring Quarters

A study of the concept and components of modern operating systems: (1) evolution of modern operating systems; (2) operations and services of operating systems; (3) file systems, protection and implementation; (4) scheduling of processors, multiprogramming; (5) memory management, partitions, virtual memory, overlap, allocation algorithms; (6) secondary memory management, scheduling of disks and drums; (7) operating system deadlocks, detection and prevention; (8) concurrent processes, semaphores, concurrent programming, synchronization; (9) operating system protection, access matrix; (10) design issues, multi-layered approach, virtual machines; (11) case studies in UNIX, VMS, TOPS, MULTICS. Prep. IIS 3604 and IIS 3610.

IIS 3610 Computer Architecture (4QH)

Fall and Spring Quarters

Structure and organization of modern computers: computer systems organization: digital logic circuits, integrated circuits, programmed logic arrays; memory organizations, design techniques for large scale memories; microprocessors, comparative study of Z80, MC68000; interfacing, I/O chips; design specifications of model microcomputers; microprogramming, organization of data path and microarchitecture; instruction formats; operating system concepts; assemblers, linkers, loaders; multi-level machines, program portability; special topics on super computer architecture; multiprocessors; non-von Neumann architecture. Prep. IIS 3600 or IIS 3116.

IIS 3613 Principles of Software Design (2QH)
(formerly 05.947)

Fall and Spring Quarters

Techniques for solving complex computer programming tasks include run-time structures in programming languages; communication, linking, and sharing of programs and data; interface design; program documentation; maintenance modification; testing and debugging. Current topics in program design such as readability, data abstraction, step-wise refinement and structured programming are also covered. Prep. IIS 3607.

IIS 3615 Analysis and Design of Computer Information Systems (4QH)

Fall Quarter

Introduction to computer information systems analysis and design techniques and the hardware and software which support such systems. Topics covered include: techniques for determining information requirements for MIS/DSSs; development of the functional systems design; and computer system design considerations such as the CPU, main memory, operating systems functions, computer languages, input devices, secondary memory, file organization, database management systems, data communications, data security, and output and display devices. The main objective of the course is to develop capability in the skeletal design of a computer system to support a given set of management needs. Prep. Admission to Graduate Program.

IIS 3617 Management Information Systems (2QH)
(formerly 05.941)

Winter Quarter

The development of a conceptual framework which emphasizes support to management decision making. Relevant cognitive and organizational characteristics of human decision making are integrated into a systems analysis approach to development of effective information systems. Case study discussions are used extensively to apply principles to realistic situations. IIS 3617 and IIS 3618 cover the same material as IIS 3218 but in two 2QH courses. Prep. 3615.

IIS 3618 MIS: Planning, Control and Development (2QH)
(formerly 05.942)

Fall Quarter

Phases of MIS design and development are examined from a planning and control viewpoint. Techniques are presented for conceptual identification of a continuing stream of information systems candidate projects, for achieving a user-oriented assessment of costs/benefit potential, and for control of the design and implementation effort. Case study discussions are used extensively to apply principles to realistic situations. Prep. IIS 3615.

IIS 3620 Computerized Financial Control Systems (2QH)
(formerly 05.944)

Spring Quarter

Considers on-line systems for financial and inventory control from the technological, legal, and social point of view. The focus of the course is on electronic funds transfer (EFT) and point of sale (POS) terminals and associated computing equipment for inter-bank and consumer banking transactions, debit card transactions, and retail management information systems to control cash and inventory. The current technological status and societal implications of EFT and POS terminals are discussed. Prep. IIS 3614 or IIS 3615.

IIS 3621 Information Systems and Society (2QH)
(formerly 05.948)

Fall Quarter

Discussion of the role computer systems play in modern society. The beneficial use of computers in commercial and industrial enterprises is considered and contrasted with the potential for infringement of individual privacy rights. Sufficient technical material on computer hardware, software, and data communications is discussed to permit assessment of system feasibility. Relevant major legislation is related to current practice in use of computer systems. IIS 3621 and IIS 3617 cover the same material as IIS 3218, but in two 2QH courses. Prep. Admission to Graduate Program.

IIS 3622 Information Systems in a Microcomputer Environment (4QH)

Spring Quarter

Explores the role of microcomputers and local area networks in providing decision support information. The IBM PC, or compatible machine, is used as a representative microcomputer. Topics covered include: PC operating system and hardware fundamentals, software selection for microcomputer based information systems (MBIS), data communications and local area networks of PCs, and approaches to the design and evaluation of MBISs. Assignments using the PC provide the opportunity to understand its capabilities and limitations and evaluate rational approaches to the selection of generic categories of PC software. Prep. IIS 3615 or equivalent.

IIS 3623 File Processing (2QH)
(formerly 05.938)

Winter Quarter

Processing of sequential, indexed-sequential, and direct/relative data files on tape and disk; record blocking, searching, sorting, and merging operations; random access techniques; introduction to data base management concepts, and if time permits an introduction to RPG. Prep. Knowledge of COBOL Programming.

IIS 3624 Software Engineering I (4QH)

Winter Quarter

An introductory course on software design techniques. Software requirements and specifications. System architecture design methodology: classifications, top-down, bottom-up, HIPO, Warnier-Orr and Jackson design methodologies. Data flow charts; module strength and independence; software reliability and maintainability in the design stage. Elements of programming methodology: style, tools, environments, documentation. Software project management. Analysis of programming languages in the light of software engineering principles. Prep. IIS 3604.

IIS 3625 Software Engineering II (4QH)

Spring Quarter

Advanced topics in software engineering: software complexity measures; memory requirements and processing time analysis; program testing and debugging methods; proving programs correct; implementation issues; elements of reliability theory and applications to software engineering. Management of software design projects; an examination of software efficiency principles through case studies of large software projects. Application and comparison of various software development tools. Prep. IIS 3624.

IIS 3626 Networks and Telecommunications (4QH)

Winter and Spring Quarters

Network goals and applications; architecture, topologies, and protocols; layered communications protocol design; layer functions, interlayer interfaces, and peer processes; performance measures; data communication techniques; wide area and local networks; channel interfaces and access schemes; workstations and server nodes; distributed systems; internetworking. Prep. Admission to Graduate Program.

IIS 3627 Software Economics (4QH)

Winter Quarter

An examination of the constructive cost model (COCOMO model) is presented in the context of the software life cycle. Case studies will be analyzed. Economic analysis tools are presented relative to software development and/or selection; marginal analysis, present value, future worth and systems analysis techniques. Methods for dealing with uncertainty and performing risk analyses. A seven step program for estimating software cost; COCOMO cost drivers, evaluation procedures and software project planning and control. Prep. IIS 3624.

IIS 3628 Data Base Management Systems (4QH)

Fall, Winter and Spring Quarters

The course treats fundamental concepts and design of data base management systems (DBMS). topics include the role of DBMS in organizations; alternative data base models - hierarchical, network and relational; underlying data structures for each data base model; example DBMS for each model type; design of an information system using a DBMS approach; practical experience with at least one DBMS on a microcomputer or minicomputer, such as RBase 5000 or Data-Trieve. Prep. IIS 3615.

IIS 3650 Engineering Analysis Utilizing Data Processing (2QH)

(formerly 05.916)

Spring Quarter

Application of computers and major high-level computer languages to the solution of engineering problems. FORTRAN and GPSS are employed in applications drawn from production and service-oriented industries to illustrate topics such as generation of random numbers, inventory simulation models, file search and sorting techniques, and root-finding algorithms. The standard software packages of SPSS and MPOS are introduced. Prep. Higher level language.

IIS 3651 Software Engineering Project (8QH)

Spring Quarter

Individual work under faculty supervision. Projects highlighting typical software engineering problems could include: development of integratable RAM resident software for desk-top functions; operating systems development; data base management systems; an enhanced word processor - spelling checker - document formatter; language and compiler projects; development of software engineering tools; software for an engineering work station. Prep. IIS 3624, permission of instructor.

IIS 3797 Engineer Degree Continuation (0QH)

Any Quarter

IIS 3798 Master's Thesis Continuation (0QH)

(formerly 05.9X1)

Any Quarter

IIS 3799 PhD Continuation (0QH)

(formerly 05.9X5)

Any Quarter

IIS 3801 Special Project in Industrial Engineering (2QH)

(formerly 05.993)

Any Quarter

Individual work under faculty supervision. Prep. Consent of advisor.

IIS 3802 Special Project in Industrial Engineering (4QH)

Any Quarter

Same as IIS 3801.

IIS 3803 Independent Study in Operations Research (2QH)

(formerly 05.919)

Any Quarter

Special topics in Operations Research by arrangement with a faculty member

IIS 3804 Special Topics (4QH)

Any Quarter

Special Topics in IE and IS. Prep. Permission of Instructor.

IIS 3805 Special Topics (2QH)

Any Quarter

Special Topics in IE and IS. Prep. Permission of Instructor.

IIS 3806 Seminar in Industrial Engineering (2QH)
(formerly 05.992)

Any Quarter

Discussion and presentations of thesis related topics by students, presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Field trips and visitations included where appropriate. Prep. Permission of instructor.

IIS 3863 Thesis (Master's Degree) (2QH)

Any Quarter

Analytical and/or experimental work conducted under the auspices of the Department. Prep. Consent of advisor.

IIS 3870 Industrial Engineer Degree Project (10QH)
(formerly 05.994)

Any Quarter

Undertaken with the approval of the candidate's advisor and the Department Graduate Committee.

IIS 3873 Industrial Engineer Degree Project (4QH)

Any Quarter

Same as IIS 3870.

IIS 3874 Industrial Engineer Degree Project (2QH)

Any Quarter

Same as IIS 3870

IIS 3881 Doctoral Thesis (8QH)

Any Quarter

Doctoral Thesis research conducted under advisorship of the doctoral student's dissertation committee. Prep. Admission to doctoral candidacy.

IIS 3883 Doctoral Thesis (4QH)

Any Quarter

Same as IIS 3881.

IIS 3884 Doctoral Thesis (2QH)

Any Quarter

Same as IIS 3881.

DEPARTMENT OF MECHANICAL ENGINEERING

The Department of Mechanical Engineering offers the degrees of Master of Science in Mechanical Engineering, Mechanical Engineer, and Doctor of Philosophy. The Master of Science degree may be pursued on either a full-time or a part-time basis. A full-time student may apply for participation in the Cooperative Plan. The Mechanical Engineer and Doctor of Philosophy degrees are pursued on a basis consistent with the residence requirements for the degree. The curriculum offers areas of concentration in Mechanics, Thermofluids Engineering, and Materials Science and Engineering.

Master of Science Degree Requirements

Students who have been accepted to the program and have received the degree of Bachelor of Science in Mechanical Engineering, or a closely-allied engineering field from a recognized college or university, will qualify for the Master of Science in Mechanical Engineering degree upon successful completion of program requirements. Students with a Bachelor of Science degree in other engineering or related science fields will qualify for the degree of Master of Science without specification.

A minimum of forty quarter hours of graduate study is required for the Master of Science degree. Full-time students, both continuous and cooperative, are required to complete a seminar program and a thesis for eight quarter hours of credit. The thesis and seminar course is not required of part-time students. All students must consult with their advisor or the Department's assigned Graduate Officer for course sequencing and the selection of elective courses in each area of concentration. Approval of course selections by the advisor or the Department's assigned Graduate Officer is required.

Mechanics

Course Requirements

Full-time

Part-time

	<u>Study</u>	<u>Study</u>
Required Core Courses.....	16 QH	16 QH
Required Electives.....	10 QH	14 QH
Thesis.....	8 QH	0 QH
Other Courses.....	6 QH	10 QH
Minimum Quarter Hours Required *..	40 QH	40 QH
*exclusive of any preparatory courses		

Required Core Courses (2 QH equivalents are in parentheses)

Credits

ME 3100 (3101,3102) Math. Methods for Mechanical Engineers.....	4
ME 3120 (3121,3122) Theory of Elasticity.....	4
ME 3140 (3141,3142) Advanced Dynamics.....	4
ME xxxx Required Core Course from Thermofluids Engineering or Materials Science and Engineering.....	4

Required Electives

ME 3400 - ME 3539 Adv. Electives in Mechanics or Design.....	10 or 14
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Thesis - ME 3860, ME 3861, ME 3862.....	8
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Other Courses

Advanced Courses in Engineering or Science with No More Than Six (6) Quarter Hours Outside the Department.....	6 or 10
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Thermofluids Engineering

Course Requirements	Full-time	Part-time
	Study	Study
Required Core Courses.....	16 QH	16 QH
Required Electives.....	8 QH	8 QH
Thesis.....	8 QH	0 QH
Advanced ME Electives.....	0 QH	8 QH
Other Courses.....	8 QH	8 QH
Minimum Quarter Hours Required*..	40 QH	40 QH
*exclusive of any preparatory courses		
Required Core Courses(2 QH equivalents are in parentheses)	Credits	
ME 3100 (3101,3102) Math. Methods for Mechanical Engineers.....	4	
ME 3200 (3201,3202) General Thermodynamics.....	4	
ME 3210 (3211,3212) Essentials of Fluid Dynamics.....	4	
ME xxxx Required Core Course from Mechanics or Materials Science and Engineering.....	4	
Required Electives Selection		
ME 3540 (3541,3542) Heat Conduction and Thermal Radiation.....	4	
ME 3544 (3545,3546) Convective Heat Transfer.....	4	
ME 3560 (3561,3562) Viscous Flow.....	4	
ME 3564 (3565,3566) Gas Dynamics.....	4	
ME 3580 (3581,3582) Statistical Thermodynamics.....	4	
ME 3584 (3585,3586) Fundamentals of Combustion.....	4	
Thesis - ME 3860, ME 3861, ME 3862.....	8	
Advanced ME Electives (ME 3400 - ME 3699).....	0 or 8	
Other Courses		
Advanced Courses in Engineering or Science with No More Than Six (6) Quarter Hours Outside the Department.....	8	

Materials Science and Engineering

Course Requirements	Mechanical Behavior of Materials		Materials Science & Engineering	
	Full-time	Part-time	Full-time	Part-time
Required Core Courses.....	16 QH	16 QH	16 QH	16 QH
Required Electives.....	4 QH	4 QH	0 QH	0 QH
Thesis.....	8 QH	0 QH	8 QH	0 QH
Other Courses				
Advanced Material Science and Engineering Electives.....	12 QH	0 QH	0 QH	0 QH
Advanced Courses in Engineering or Science.....	0 QH	20 QH	16 QH	24 QH
Minimum Quarter Hours Required*.....	40 QH	40 QH	40 QH	40 QH
*exclusive of any preparatory courses				
Required Core Courses(2 QH equivalents are in parentheses)			Credits	
ME 3250,3251 Advanced Physical Metallurgy I & II.....			2 each	
ME 3260,3261 Thermodynamics of Materials I & II.....			2 each	
ME 3270,3271 Material Science & Engineering I & II.....			2 each	
ME xxxx Required Core Course from Mechanics or Thermofluids Engineering.....			4	
Required Elective				
ME 3100 (3101,3102) Math Methods of Mechanical Engineers.....			4	
Thesis - ME 3860, ME 3861, ME 3862.....			8	
Other Courses				
Advanced Material Science Electives and Engineering Electives (ME 3600 - ME 3659); Up to six (6) quarter hours can be taken outside the department.....			12	
Advanced courses in Engineering or Science with No More Than Six (6) Quarters Outside the Department.....			20,16, or 24	

The Mechanical Engineer Degree

The Mechanical Engineer degree program is offered for those who wish to undertake graduate study beyond the Master of Science degree without committing themselves to a program as extensive as that required for the Doctor of Philosophy degree. The program permits a candidate to pursue a course of study at the upper graduate level in more than one area of Mechanical Engineering as distinguished from the specialization usually associated with the doctoral program.

Qualification, Degree Candidacy and Examinations

A student admitted to the Mechanical Engineer degree program will be designated a Candidate for this degree. The Candidate's advisor normally will be the faculty member who will supervise the thesis. A student must maintain a 3.00 grade point average to qualify for the degree. Students admitted on a conditional basis may be required to pass special examinations. The Graduate Committee will determine the need for and will administer any such special examinations. A final oral examination consisting of a defense of the thesis may be required if the Candidate's advisor decides.

Program Requirements

A minimum of 40 quarter hours of credit beyond the Master of Science degree is required. Up to 10 quarter hours of credit will be permitted for work on a thesis. A student would have chosen two areas of concentration prior to acceptance to furnish the broad background which characterizes the degree of Mechanical Engineer.

Any transfer of credits must be approved by the Mechanical Engineering Graduate Committee. After admission to the program, a maximum of five years will be permitted for completion of the degree. Following approval of the Candidate's program, registration must be continuous. Withdrawal or changes in the program must be approved by the Graduate Committee.

Language Requirement

There is no language requirement for the Mechanical Engineer degree.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the academic year or by four academic quarters of half-time graduate work during two consecutive academic years. Plans for satisfying the residence requirement on a half-time basis must be approved by the Graduate Committee.

Thesis

To be awarded the Mechanical Engineer degree, each candidate must complete a thesis demonstrating a high level of competence in research, development, or design in the field of Mechanical Engineering. The effort normally expected will be the equivalent of 10 quarter hours of graduate course work.

The Doctor of Philosophy Degree

The degree of Doctor of Philosophy is awarded to those candidates who demonstrate high attainment and research ability in the field of Mechanical Engineering. Upon acceptance into the program, a student is designated a Doctoral Student.

Qualifying Examination

The qualifying examination in the Department of Mechanical Engineering is offered yearly, usually during the Winter Quarter, and is both written and oral. At the present time, the written portion of the qualifying examination is six hours in length and covers, with equal emphasis, four different areas. A student must select one area from each of the three groups A, B, and C, plus another area either listed below or unlisted, but considered equivalent and approved by the Graduate Committee. A student who is classified as interdisciplinary, may request modifications in testing areas. Requests must be approved by the Graduate Committee.

- A. Concepts of Thermodynamics; Applied Thermodynamics
- B. Dynamics; Mechanics of Deformable Bodies
- C. Heat and Mass Transfer; Fluid Mechanics; Mechanical Behavior of Materials; Physical Metallurgy

The Department of Mechanical Engineering reserves the right to modify the details of the qualifying examination. Approval of the college and reasonable notification to candidates is inferred relative to modifications.

The oral portion of the qualifying examination is conducted by a committee consisting of at least four members appointed by the Graduate Committee. A typical committee is composed of two members specializing in the student's major area plus one member from each of two other areas.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his Master of Science degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the Master of Science degree. Because degree candidacy must be established before the Graduate Committee will act to approve course programs or dissertation proposals, the qualifying examination should be taken at the earliest opportunity. If the examination is failed, it may be repeated with permission of the departmental Graduate Committee.

All Doctoral Students must take the qualifying examination within 18 months of acceptance.

After 40 quarter hours of graduate work have been taken with satisfactory grades and upon successful completion of the qualifying examination, a student is designated a Doctoral Candidate.

Course Requirements

To receive the PhD degree a candidate must complete a program of course work approved by the Graduate Committee. Courses completed prior to admittance to the doctoral program are subject to the approval of the Graduate Committee. Each program must contain at least twelve quarter hours of course work, preferably outside of the department, in an area other than that in which the candidate is concentrating. Attainment of a 3.00 grade point average for the courses in the "minor" portion of the program will signify satisfactory completion of that portion.

Language Requirement

A reading knowledge of one foreign language is required. Proficiency in a language shall be determined in a manner prescribed by the departmental Graduate Committee. The language requirement must be fulfilled within six months after the dissertation proposal has been accepted but no less than six months before the degree is granted.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work beyond the Master of Science degree. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the Master of Science degree.

Dissertation

After degree candidacy has been established, a candidate must complete a dissertation which embodies the results of extended research and includes materials suitable for publication.

The departmental Graduate Committee may require the completion of certain course work before permitting dissertation work to commence. A Dissertation Committee will be appointed by the departmental Graduate Committee. The Dissertation Committee will be kept informed of the work and will be responsible for initial approval of the dissertation in its final form.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the dissertation has been completed and approved. This examination is based upon the subject matter of the dissertation and a defense of it.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination cannot be held until two weeks have elapsed after the dissertation has been registered and accepted by the Graduate School and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will include the subject matter of the doctoral dissertation and significant developments in the field of the dissertation work. Other fields may be included if recommended by the examining committee.

Faculty

Charles A. Berg, Chairman

Yaman Yener, Director of Graduate Programs

Professors

Adams, George G., PhD, University of California at Berkley; response of elastic structures to moving loads; tribology stress distributions at material interfaces; elasticity; stability

Berg, Charles A., ScD, MIT; mechanical properties of materials; fracture, fatigue and wear; theoretical mechanics; engineering properties of materials; energy conservation and advanced technology; history of technology; engineering aspects of economics

Cipolla, John W., Jr., PhD, Brown University; laser-aerosol interactions including thermophoresis; heat and mass transfer; radiative transfer; kinetic theory

Dunn, John F., Jr., ScD, MIT; system dynamics, vibration, feedback control, electrohydraulic servosystems, servovalves

Foster, Arthur R., MEng, Yale University; solar thermal heating and cooling, nuclear fuel cycle analysis; functional analysis of nuclear and fossil power cycles

Gorlov, Alexander M., PhD, Moscow Institute of Transport Engineers; mechanical and structural design; low-head hydropower systems conversion; theoretical and applied mechanics

Murphy, Richard J., PhD, MIT; production and consolidation of amorphous metal powder

Nowak, Welville B., Donald W. Smith Professor of Mechanical Engineering, PhD, MIT; materials science and engineering; thin films for resistance to corrosion, diffusion and wear; photovoltaic solar cells; electronic materials

Rossettos, John N., PhD, Harvard University; buckling and vibration of stiffened plates, mechanics of composite materials, applied mechanics

Zotos, John, MetEng, MIT; mathematical modeling of the chemical, mechanical, and physical properties of engineering alloys; materials science and engineering; thermodynamics of materials; joining similar and dissimilar metals and alloys

Associate Professors

Blanchard, Ralph S., MS, Northeastern University; vibration analysis; mechanical design; product liability

Blucher, Joseph T., PhD, MIT; surface treating processes CVD, PVD, ion nitriding, and laser processing; metal matrix composites; powder metallurgy; welding; cutting tools; manufacturing processes; failure analysis; fracture; fatigue; wear

Hashemi, Hamid N., PhD, MIT; materials; composite materials; non-destructive evaluation; mechanics; finite-elements; fatigue; wear; reliability-centered maintenance

Kenney, Thomas E., PhD, MIT; fluid mechanics including flow visualization; combustion; interaction between combustion and fluid motion; spark ignition engine combustion

Kowalski, Gregory J., PhD, University of Wisconsin-Madison; radiation and combined-mode heat transfer; heat and mass transfer; fluid dynamics

Long, Bertram, ME, MIT; biomechanical systems; structural elasticity

Metghalchi, Mohamad, ScD, MIT; internal combustion engines; energy conversion; air pollution; laminar and turbulent flame speeds; chemical kinetics

Narusawa, Uichiro, PhD, University of Michigan; natural and double-diffusive convection in enclosures and saturated porous media; two-phase flows; thermocapillary flow

Yener, Yaman, PhD, North Carolina State University; heat and mass transfer, radiative transfer, radiation-aerosol interaction including thermophoresis

Yorra, Alvin J., MS, MIT; motion of spinal components relating to disc wear; forensic design; rocket dynamics

Zeid, Ibrahim, PhD, University of Akron; CAD/CAM, finite-element method, applied mechanics

Assistant Professors

Sullivan, Robert L., MS, Columbia University; computational fluid mechanics; convection heat transfer; thermodynamics

Taslim, Mohammad E., PhD, University of Arizona; computational and experimental fluid mechanics and heat transfer; double diffusive convection

Wang, Wego, ScD, MIT; mechanical properties of materials; microstructural analysis; rapid solidification process; computer simulation

Advisors

Full-time

Part-time

Thermofluids Engineering
Materials Science & Engg
Mechanics

(A-Z) Prof. Metghalchi
(A-Z) Prof. Nowak
(A-Z) Prof. Adams

(A-Z) Prof. Sullivan
(A-Z) Prof. Nowak
(A-Z) Prof. Adams

MECHANICAL ENGINEERING

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time. 'Odd' and 'Even' years refer to the fall quarter of the academic year, i.e., Spring 87 which is in the 86-87 academic year, would be an 'Even' year.

ME 3100 Mathematical Methods for Mechanical Engineers (4QH)

(formerly 02.825)

Fall Quarter

Embodies the material in ME 3101 and ME 3102. Prep. Admission to the Graduate School of Engineering.

ME 3101 Mathematical Methods for Mechanical Engineers I (2QH)

(formerly 02.826)

Fall Quarter

Bessel and Legendre functions, boundary-value problems and series of orthogonal functions. Partial differential equations and applications to heat transfer, fluid flow, vibrations and wave propagation. Prep. Admission to the Graduate School of Engineering.

ME 3102 Mathematical Methods for Mechanical Engineers II (2QH)

(formerly 02.827)

Winter Quarter

Vector analysis; divergence theorem; functions of a complex variable; Laurent series and singular points; residues and contour integration; applications. Prep. Admission to the Graduate School of Engineering.

ME 3120 Theory of Elasticity (4QH)

(formerly 02.807)

Fall Quarter

Embodies the material in ME 3121 and ME 3122. Prep. Admission to the Graduate School of Engineering.

ME 3121 Theory of Elasticity I (2QH)

(formerly 02.804)

Fall Quarter

Analysis of Cartesian tensors using indicial notation. Stress and strain concepts; point stress and strain; relation to tensor concepts. Governing equations for the determination of stress and displacement distributions in a solid body. Exact solutions of the governing equations for elastic solids. Prep. Admission to the Graduate School of Engineering.

ME 3122 Theory of Elasticity II (2QH)

(formerly 02.805)

Winter Quarter

Plane stress and strain problems in rectangular and polar coordinates including thermal stress. Relation of elasticity theory to strength of materials. Torsion of prismatic and axially symmetric bars. Bending of thin flat rectangular and circular plates. Prep. ME 3121.

ME 3140 Advanced Dynamics (4QH)

Fall Quarter

Embodies the material in ME 3141 and ME 3142. Prep. Admission to the Graduate School of Engineering.

ME 3141 Advanced Dynamics I (2QH)

(formerly 02.847)

Fall Quarter

Kinematics of particles and rigid bodies. Modeling and application of fundamental laws of motion. Dynamic response of lumped parameter systems. Prep. Admission to the Graduate School of Engineering.

ME 3142 Advanced Dynamics II (2QH)

(formerly 02.848)

Winter Quarter

Continuation of ME 3141. Lagrange's equations. Applications in two and three dimensions. Prep. ME 3141.

ME 3200 General Thermodynamics (4QH)

(formerly 02.903)

Winter Quarter

Fundamentals of equilibrium thermodynamics will be examined. Topics include: work, energy, heat, temperature, available energy, entropy, first and second law of thermodynamics, simple systems, closed and open systems, availability loss and irreversibility, heat engines, multicomponent systems, mixtures of gases, chemical reactions and chemical equilibrium. Equivalent to courses ME 3201 and ME 3202. Prep. Admission to the Graduate School of Engineering.

ME 3201 General Thermodynamics I (2QH)

(formerly 02.901)

Fall Quarter

ME 3201 and ME 3202 present the same material contained in ME 3200, but in two 2QH courses. Prep. Admission to the Graduate School of Engineering.

ME 3202 General Thermodynamics II (2QH)

(formerly 02.902)

Winter Quarter

Continuation of ME 3201. Prep. ME 3201.

ME 3210 Essentials of Fluid Dynamics (4QH)

(formerly 02.821)

Fall Quarter

This is a fundamental course in fluid dynamics designed to prepare the student for more advanced courses in the thermofluids curriculum while providing a strong background in fluid mechanics. Topics to be covered may include: Cartesian tensors; Differential and integral formulation of the equations of conservation of mass, momentum and energy; molecular and continuum transport phenomena; The Navier-Stokes equations; Vorticity; inviscid, incompressible flow, the velocity potential and Bernoulli's equation; Viscous incompressible flow; the stream function; some exact solutions; energy equation including heat conduction and viscous dissipation. This material is also covered in the two 2QH courses ME 3211 and ME 3212. Prep. Admission to the Graduate School of Engineering.

ME 3211 Essentials of Fluid Dynamics I (2QH)

(formerly 02.819)

Fall Quarter

ME 3211 and ME 3212 present the same material with the same prerequisites as ME 3210, but in two 2QH courses. Prep. Admission to the Graduate School of Engineering.

ME 3212 Essentials of Fluid Dynamics II (2QH)

(formerly 02.820)

Winter Quarter

Continuation ME 3211. Prep. ME 3211.

ME 3250 Advanced Physical Metallurgy I (2QH)

(formerly 02.953)

Fall Quarter, Odd Years

Dislocation theory; including such topics as dislocation stress fields, self-energy, velocity, interactions mechanisms, image forces, and theories of yielding. Prep. A recent introductory material science course.

ME 3251 Advanced Physical Metallurgy II (2QH)

(formerly 02.954)

Winter Quarter, Odd Years

Mechanical behavior of metals. Application of dislocation theory to micro-plasticity, strain hardening, strengthening mechanisms and creep. Prep. ME 3251.

ME 3260 Thermodynamics of Materials I (2QH)

(formerly 02.960)

Fall Quarter, Odd Years

Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. Prep. Engineering materials.

ME 3261 Thermodynamics of Materials II (2QH)

(formerly 02.961)

Winter Quarter, Odd Years

Continuation of ME 3260 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems. Prep. ME 3260.

ME 3270 Materials Science and Engineering I (2QH)

(formerly 02.970)

Fall Quarter, Even Years

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. Prep. A recent introductory material science course.

ME 3271 Materials Science and Engineering II (2QH)

(formerly 02.971)

Winter Quarter, Even Years

Continuation of ME 3270 into additional topics such as electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. Prep. ME 3270.

ME 3341 Power Generating Systems I (2QH)

(formerly 02.935)

Fall Quarter

Power generating systems that employ fossil, nuclear, and heat recovery boilers operating in conjunction with steam and organic Rankine cycles are examined. The steady-state and transient operation of each power generating system is studied from both an analytical and conceptual point of view. The effect that site conditions, fuel quality, plant loading schedule and environmental regulations have on system design, performance and operation is presented. Prep. ME 3200 or equivalent, or may be taken concurrently with permission of instructor.

ME 3342 Power Generating Systems II (2QH)

(formerly 02.936)

Winter Quarter

An extension of ME 3341. The same type of examination is conducted of systems incorporating gas, hydraulic, and wind turbines, solar and fuel cells, energy storage, combined cycles, and cogenerating systems. The objective of Power Generating Systems I and II is to develop the skills needed to conduct sound technical evaluations of the power generating systems being built today. Prep. ME 3341.

ME 3343 Power Generation Economics and Planning (2QH)

(formerly 02.938)

Spring Quarter

Current and constant-dollar power generation costs are examined. Life cycle economic analysis, such as revenue requirements, discounted cash flow, internal rate of return, and payback analyses, are presented. The planning methodologies used by electric utilities and private industry to evaluate and select power generating systems are presented. Prep. ME 3342.

ME 3351 Solar Thermal Engineering I (2QH)

(formerly 02.855)

Fall Quarter, Odd Years

A model is developed for the hourly direct and diffuse radiation under a cover of scattered clouds and the transmission and absorption of this radiation by passive and active systems. The design of air heating systems and the storage of the collected energy by a pebble-bed are considered, as well as elements of heat exchanger design. A study of the economics of a domestic water and/or space heating system is made using f-chart analysis. Prep. CHE 3659, Solar Energy Thermal Processes or equivalent background.

ME 3352 Solar Thermal Engineering II (2QH)

(formerly 02.856)

Winter Quarter, Odd Years

The design and analysis of several solar thermal systems are considered, such as: LiBr-H₂O absorption cooling units, heat pumps, compound parabolic collectors, and the heat pipe type of solar collector. Prep. ME 3351.

ME 3360 Turbomachinery Design (4QH)

Winter Quarter

Preliminary design methods and analytical tools applicable to turbomachinery are presented. Design criteria and performance characteristics at design and off-design operating conditions are discussed for several important types of turbomachinery. Axial flow compressors and turbines (gas and steam) are studied in some depth, including topics such as compressor surge, turbine blade cooling, and steam wetness effects. Centrifugal compressors, radial inflow turbine, pumps, fans, and water turbines are also studied. Turbomachinery mechanical design limitations are discussed. The use of empirical data on blade cascade performance in blade selection is examined. Numerical methods of analyzing two- and three-dimensional flows in turbomachinery (e.g., conformal transformation and streamline curvature) are presented. Two in-depth design projects are assigned. This material is also covered in the two 2QH courses ME 3361 and ME 3362. Prep. Admission to the Graduate School of Engineering, including undergraduate preparation in fluid mechanics and thermodynamics.

ME 3361 Turbomachinery Design I (2QH)

(formerly 02.930)

Fall Quarter

ME 3361 and ME 3362 present the same material contained in ME 3360, but in two 2QH courses. Prep. Admission to the Graduate School of Engineering, including undergraduate preparation in fluid mechanics and thermodynamics.

ME 3362 Turbomachinery Design II (2QH)

(formerly 02.931)

Winter Quarter

Continuation of ME 3361. Prep. ME 3361.

ME 3370 Fundamentals of Maintenance in Design (4QH)

(new course)

Fall Quarter, As Announced

Basic tools of probability analysis will be covered. Failure modes and actual functional behavior of designed components will be presented in the probability forms. Age reliability will be discussed. Nondescriptive evaluation techniques will be presented and demonstration tests will be performed. Fault tree analysis and decision logic will be covered. Prep: Admission to the Graduate School of Engineering.

ME 3380 Fundamentals of Instrumentation (2QH)

(formerly 02.853)

Fall Quarter

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems. Prep. Bachelor of Science degree.

ME 3381 Industrial Process Control (2QH)

(formerly 02.854)

Winter Quarter

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, PH. Prep. ME 3380.

ME 3386 Nuclear Engineering I (2QH)

(formerly 02.942)

Fall Quarter, Even Years

Topics include: growth of nuclear power industry; study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion; radiation health physics; principles of shielding; nuclear instrumentation; production and application of radioisotopes; neutron interactions and slowing down theory; neutron activation analysis. (Not open to students who have completed ME 1541 and ME 1542). Prep. Admission to the Graduate School of Engineering.

ME 3387 Nuclear Engineering II (2QH)

(formerly 02.943)

Winter Quarter, Even Years

Comparison of thermal, fast, and breeder reactors; four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multi-group theory; bare and reflected thermal reactors; energy production and distribution within core; flux shaping; transient reactor behavior and control; factors affecting reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; Xenon buildup after shutdown. (Not open to students who have completed ME 1541 and ME 1542). Prep. ME 3386.

ME 3388 Nuclear Engineering III (2QH)

(formerly 02.944)

Spring Quarter, Even Years

Reactor design considerations; interrelationship of reactor physics, control, engineering, materials, safety, and fuel cycle management; reactor types; radiation damage and reactor materials; nuclear fuels; reactor heat transfer; economics of nuclear power; environmental effects. (Not open to students who have completed ME 1541 and ME 1542). Prep. ME 3387.

ME 3401 Advanced Math Methods for Mechanical Engineers I (2QH)

(formerly 02.828)

Spring Quarter, Even Years

Matrices and linear equations. Variational calculus and applications. Approximate methods of engineering analysis. Selected topics of current interest. Prep. ME 3101 and ME 3102.

ME 3402 Advanced Math Methods for Mechanical Engineers II (2QH)

Spring Quarter, Odd Years

Integral transforms; asymptotic expansion; regular and singular perturbation methods. Examples drawn from solid mechanics, vibration, and fluid mechanics. Prep. ME 3101 & ME 3102.

ME 3410 Numerical Methods in Mechanical Engineering (4QH)

All Winter Quarters. Fall Quarter, Even Years

Numerical methods applied to problems in mechanical engineering. Solution of linear and non-linear systems of equations, interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations: explicit and implicit methods, multi-step methods, predictor-corrector methods. Numerical solution of partial differential equations with emphasis on parabolic and elliptic problems occurring in mechanical engineering. This material is also covered in the two 2QH courses ME 3411 and ME 3412. Prep. ME 3100.

ME 3411 Numerical Methods in Mechanical Engineering I (2QH)

As Announced

ME 3411 and ME 3412 present the same material with the same prerequisites as ME 3410, but in two 2QH courses.

ME 3412 Numerical Methods in Mechanical Engineering II (2QH)

As Announced

Continuation of ME 3411. Prep. ME 3411.

ME 3420 Mechanics of Inelastic Solids (4QH)

Spring Quarter

Constitutive relations governing inelastic solids. Yield surface; plastic stress-strain relations; Prandtl-Reuss equations. Viscoelastic stress-strain relations including the Maxwell and Voigt models. Viscoplasticity. Prep. ME 3122. Not available to students who have taken ME 3421.

ME 3421 Introduction to Plasticity (2QH)

(formerly 02.809)

Winter Quarter, Even Years

Basic experimental information. Review of stress and strain tensors. Elastic stress-strain relations. Yield surface. Plastic stress-strain relations. Prandtl-Reuss equations. Simple applications. Prep. ME 3121.

ME 3423 Theory of Elasticity III (2QH)

(formerly 02.806)

Spring Quarter

Approximate solutions for stress and displacement distributions in elastic solids; discrete solutions using finite difference and finite element methods; energy principles and the calculus of variations; use of energy principles to obtain approximate continuous solutions. Prep. ME 3122, Theory of Elasticity II.

ME 3432 Engineering Fracture Mechanics I (2QH)

(formerly 02.838)

Fall Quarter, Odd Years

Fundamentals of brittle fracture; theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, applicability of same. Linear elastic fracture mechanics; Orowan/Irwin extension to metals, effective surface tension and relation to fracture toughness, plastic zone size correction; geometry effects on fracture toughness; plane strain/plane stress fracture toughness, thickness effects. Prep. ME 3122.

ME 3433 Engineering Fracture Mechanics II (2QH)

(formerly 02.839)

Winter Quarter, Odd Years

Experimental determination of fracture toughness; slow crack growth "pop in", arrest, R-G curves, compliance techniques for determining elastic energy release rate. Alternate fracture toughness concepts; resistance curve, crack opening displacement, the J integral. Application of fracture mechanics to fatigue. Design methods to minimize risks of catastrophic failure will be emphasized. Prep. ME 3432.

ME 3434 Engineering Fracture Mechanics III (2QH)

(formerly 02.829)

Spring Quarter, Odd Years

Application of fracture mechanics to fatigue, strain energy density criteria for fracture, arrest criteria. "Work of Fracture" specimen. Application of fracture mechanics to structural analysis. Effect of anisotropy in fracture mechanics. Fracture dynamics, dynamic fracture toughness, strain rate effects. Micro-second fracture phenomenon and criteria, spall, Butcher-Tuler criterion, NAG model. Residual strength, design approaches will be emphasized. Prep. ME 3433.

ME 3440 Advanced Mechanics of Materials (4QH)

(formerly 02.812)

Winter Quarter

Embodies the material in ME 3441 and ME 3442. Prep. Admission to the Graduate School of Engineering.

ME 3441 Advanced Mechanics of Materials I (2QH)

(formerly 02.810)

Fall Quarter

Review of fundamental stress and deformation concepts; strain energy density; introduction to energy methods with application to beams, frames and rings; Ritz method. Prep. Admission to the Graduate School of Engineering.

ME 3442 Advanced Mechanics of Materials II (2QH)

(formerly 02.811)

Winter Quarter

Beams on elastic foundations. Concept of stability as applied to one and two degree-of-freedom systems. Buckling of bars, frames and rings. Prep. ME 3441.

ME 3443 Advanced Mechanics of Materials III (2QH)

(formerly 02.813)

Spring Quarter, Even Years

Selected topics in advanced mechanics; will vary with current interest. Prep. ME 3442, Advanced Mechanics of Materials II or consent of the instructor.

ME 3446 Theory of Shells (2QH)

(formerly 02.815)

Spring Quarter, Odd Years

Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. Prep. ME 3122.

- ME 3455 Mechanics of Composite Materials (2QH)
(formerly 02.816) Winter Quarter, Odd Years
Constitutive equations for anisotropic laminated composite materials, and application to the structural response of beams and plates. Bending and buckling of symmetric and non-symmetric laminates. Prep. ME 3121.
- ME 3466 Automatic Control Engineering I (2QH)
(formerly 02.850) Fall Quarter, Even Years
Study of control action; analysis and design by use of root-locus and frequency-domain techniques. Prep. ME 3142 or permission of instructor.
- ME 3467 Automatic Control Engineering II (2QH)
(formerly 02.851) Winter Quarter, Even Years
Further consideration of linear systems including compensation methods and multiple-input. Techniques for the treatment of non-linear systems. Prep. ME 3466.
- ME 3468 Robot Mechanics and Control (4QH)
Spring Quarter
Kinematics and dynamics of robot manipulators are the focus of the first part of the course. Kinematics cover the development of kinematic equations of manipulators, the inverse kinematic problems, and motion trajectories. Dynamics of manipulators for the purpose of control are covered employing Lagrangian mechanics. The second part of the course focuses on the control and programming of robot manipulators. Steady state errors and calculations of servo parameters are covered. High level programming languages are discussed. Prep. ME 3142.
- ME 3470 Vibration Theory and Applications (4QH)
(formerly 02.844) Winter Quarter
Embodies the material in ME 3472 and ME 3473. Prep. ME 3142 or ME 3471.
- ME 3471 Vibration Theory and Applications A (2QH)
(formerly 02.841) As Announced
Modeling of vibratory systems; one-degree-of-freedom systems (determination of equations of motion using free-body and energy methods); forced and free vibrations through two degrees of freedom. Prep. Admission to the Graduate School of Engineering.
- ME 3472 Vibration Theory and Applications I (2QH)
(formerly 02.842) Fall Quarter, Odd Years
Laplace transformation techniques; phase-plane diagrams; multiple-degree-of-freedom Systems; free and forced vibrations with and without damping. Prep. ME 3471 or ME 3142 or permission of the instructor.
- ME 3473 Vibration Theory and Applications II (2QH)
(formerly 02.843) Winter Quarter, Odd Years
Systems with distributed mass and stiffness. Extensional, torsional and flexural vibrations of bars. Prep. ME 3472.
- ME 3474 Vibration Theory and Application III (2QH)
(formerly 02.846) As Announced
Selected topics of current interest in vibrations. Prep. ME 3473.
- ME 3475 Random Vibration (2QH)
(formerly 02.845) Spring Quarter, Odd Years
Description of stochastic processes. Impulse response and frequency response of linear time-invariant dynamic systems. Correlations and spectra of stationary response. Crossing rates, peaks and envelopes. Failure under random loading. Poisson pulse processes. Measurement, identification, and response problems. Coherence. Space-time correlations and cross-spectra. Digital data processing. Application to vehicles and structures subjected to wide-band excitation. Prep. ME 3473.

ME 3480 The Finite Element Method (4QH)

(formerly 02.949)

Spring Quarter

Embodies the material in ME 3481 and ME 3482. Prep. ME 3101 and ME 3102 or consent of the instructor.

ME 3481 Finite Element Analysis (2QH)

(formerly 02.840)

Fall Quarter

Introduction to the finite element method. Variational formulations; simple interpolation functions and element stiffness matrices. Triangular and rectangular elements. Assembly technique and constraining of resulting equations. Elementary applications. Prep. ME 3101 and ME 3102 or consent of the instructor.

ME 3482 Advanced Finite Element Method I (2QH)

(formerly 02.947)

Winter Quarter

Isoparametric element formulation of higher order and three dimensional elements. Rayleigh-Ritz and Galerkin formulations. Applications of finite element theory to mechanical engineering problems in the areas of solid mechanics, heat transfer, and fluid mechanics. The use of a finite element general purpose commercial package is included. Prep. ME 3481.

ME 3483 Advanced Finite Element Method II (2QH)

(formerly 02.948)

Spring Quarter, Even Years

The dynamic finite element formulation with explicit and implicit time integration schemes for transient analysis. Solution methods for finite element equilibrium equations, including material and geometrical nonlinearities. The general structure of computer procedures and codes. Influence of computer aided design technology. Use of an in-house general purpose commercial code is included. Prep. ME 3482.

ME 3500 Computer Aided Graphics and Design (4QH)

Winter Quarter

Basic aspects of interactive computer graphics are covered. Topics include hardware and software concepts, design principles for the user-computer interface, geometrical transformation, display architecture, and data structures. Algorithms for removing hidden edges and surfaces, shading models, and intensity and colors are also covered. The second part of the course deals with the concepts of computational and numerical geometry and design of curves and surfaces. Solid modeling techniques are presented. Discussions of in-house computer aided graphics and Design packages are included. Prep. Admission to the Graduate School of Engineering and programming experience.

ME 3540 Heat Conduction and Thermal Radiation (4QH)

(formerly 02.910 and 02.913)

Winter Quarter

Formulation of steady and unsteady state one and multi-dimensional heat conduction problems. Solution techniques for linear problems including the method of separation of variables, Laplace transforms and integral transforms. Approximate analytical methods. Phase change problems. Non-linear problems. Nature of thermal radiation. Blackbody and radiation from a blackbody. Radiation from a non-black surface element. Radiative exchange among surfaces separated by a non-participating medium. Interaction of radiation with other modes of heat transfer in non-participating media. Numerical techniques in heat transfer are covered in ME 3410. Engineering. This material is also covered in the two 2QH courses ME 3541 and ME 3542. Prep. ME 3100 and undergraduate course in heat transfer.

ME 3541 Heat Conduction and Thermal Radiation I (2QH)

(formerly 02.910)

Fall Quarter

ME 3541 and ME 3542 present the same material with same prerequisites as ME 3540, but in two 2QH courses.

ME 3542 Heat Conduction and Thermal Radiation II (2QH)

(formerly 02.913)

Winter Quarter

Continuation of ME 3541. Prep. ME 3541.

ME 3544 Convective Heat Transfer (4QH)

(formerly 02.911) Winter Quarter, Even Years; Fall Quarter, Odd Years
Fundamental equations of convective heat transfer. Heat transfer in incompressible external laminar boundary layers. Integral boundary layer equations. Laminar forced convection in internal flows. Turbulent forced convection in internal and external flows. Analogies between heat and momentum transfer; the Reynolds, Taylor and Martinelli analogies. Natural convection. Heat transfer in high-speed flow. Transient forced convection. Convection and radiation in non-participating media. This material is also covered in the two 2QH courses ME 3545 and ME 3546. Prep. ME 3100, ME 3210 and undergraduate course in Heat Transfer.

ME 3545 Convective Heat Transfer I (2QH)
(formerly 02.911)

As Announced

ME 3545 and ME 3546 present the same material with the same prerequisites as ME 3544, but in two 2QH courses.

ME 3546 Convective Heat Transfer II (2QH)
(formerly 02.911)

As Announced

Continuation of ME 3545. Prep. ME 3545.

ME 3548 Radiative Transfer (4QH)

Spring Quarter, Odd Years

Electromagnetic background. Fundamentals of radiation in absorbing, emitting and scattering media. Equation of radiative transfer. Approximate methods in the solution of the equation of radiative transfer. Singular-eigenfunction expansion technique. Pure radiative transfer in participating media. Interaction of radiation with conduction and/or convection. The Monte Carlo technique. This material is also covered in the two 2QH courses ME 3549 and ME 3550. Prep. ME 3540.

ME 3549 Radiative Transfer I (2QH)

As Announced

ME 3549 and ME 3550 present the same material with the same prerequisites as ME 3548, but in two 2QH courses.

ME 3550 Radiative Transfer II (2QH)

As Announced

Continuation of ME 3549. Prep. ME 3549.

ME 3552 Two Phase Flow (4QH)

Winter, Odd Years

This course is aimed at the understanding of the basic concepts of heat and mass transfer associated with phase change and multi-phase flows. Some of the specific subjects to be discussed are: boiling heat transfer (nucleate boiling, film boiling and bubble dynamics); evaporation and condensation; liquid-gas two phase flow and gas-solid and liquid-solid two phase flows. This material is also covered in the two 2QH course ME 3553 and ME 3554. Prep. ME 3100 (or equivalent) and undergraduate heat transfer.

ME 3553 Two Phase Flow I (2QH)

As Announced

ME 3553 and ME 3554 present the same material as ME 3552 with the same prerequisites but in two 2QH courses.

ME 3554 Two Phase Flow II (2QH)

As Announced

Continuation of ME 3553. Prep. ME 3553.

ME 3556 Heat Transfer Processes in Microelectronic Devices (4QH)

Spring Quarter

The course will discuss and develop state-of-the art methods used to predict the heat transfer rates from microelectronic devices and packages and to simulate transport phenomena in manufacturing processes associated with microelectronic devices. Topics will be selected from the current literature and may include use of latent heat reservoirs, boiling jet impingement cooling, control volume approaches to extended surfaces, calculation of thermal contact conductances and natural convection in enclosures. Simulation of laser assisted thermophoretic deposition and laser cladding processes will also be developed. This material is also contained in the two 2QH courses ME 3557 and ME 3558. Prep. ME 3100 (or equivalent) and undergraduate heat transfer or consent of instructor.

ME 3557 Heat Transfer Processes in Microelectronic Devices I (2QH)

As Announced

ME 3557 and ME 3558 provide the same material as ME 3556 with the same prerequisites, but in two 2QH course.

ME 3558 Heat Transfer Processes in Microelectronic Devices II (2QH)

As Announced

Continuation of ME 3557. Prep. ME 3557.

ME 3560 Viscous Flow (4QH)

Spring Quarter, Odd Years

Review of conservation of mass, momentum, and energy for compressible viscous flow. Discussion of the mathematical character of the basic equations and analysis of some exact solutions. Investigation of low Reynolds number flow. Exact and approximate approaches to laminar boundary layers in high reynolds number flows. Stability of laminar flows and the transition to turbulence. Treatment of incompressible turbulent mean flow; internal and external flows. Extensions to compressible boundary layers. This material is also covered in the two 2QH courses ME 3561 and ME 3562. Prep. ME 3100 and ME 3210.

ME 3561 Viscous Flow I (2QH)

As Announced

ME 3561 and ME 3562 present the same material with the same prerequisites as ME 3560, but in two 2QH courses.

ME 3562 Viscous Flow II (2QH)

As Announced

Continuation of ME 3561. Prep. ME 3561.

ME 3564 Gas Dynamics (4QH)

(formerly 02.823 and 02.824)

Spring Quarter, Even Years

The consequences of fluid compressibility are studied. Shock waves and the theory of characteristics are discussed with specific consideration given to two-dimensional steady flows and one-dimensional unsteady flows. Additional topics may include axially symmetric steady flow, small perturbation theory, similarity rules, the hodograph method, or some aspects of physical acoustics. This material is also contained in the two 2QH courses ME 3565 and ME 3566. Prep. ME 3210.

ME 3565 Gas Dynamics I (2QH)

(formerly 02.823)

As Announced

ME 3565 and ME 3566 present the same materials with the same prerequisites as ME 3564, but in two 2QH courses. Prep. ME 3210.

ME 3566 Gas Dynamics II (2QH)

(formerly 02.824)

As Announced

Continuation of ME 3565. Prep. ME 3565.

ME 3568 Computational Fluid Dynamics With Heat Transfer (4QH)

All Spring Quarters. Fall Quarter, Odd Years

Finite difference methods for solving partial differential equations with particular emphasis on the equations of fluid dynamics and convective heat transfer. Integral methods for boundary layers and their coupling to potential flow solutions. Use of coordinate transformations and body-oriented coordinate systems. Application of superposition techniques in convective heat transfer problems. This material is also covered in the two 2QH courses ME 3569 and ME 3570. Prep. ME 3210 and ME 3410.

ME 3569 Computational Fluid Dynamics With Heat Transfer I (2QH)

As Announced

ME 3569 and ME 3570 present the same material with the same prerequisites as ME 3568, but in two 2QH courses.

ME 3570 Computational Fluid Dynamics With Heat Transfer II (2QH)

As Announced

Continuation of ME 3569. Prep. ME 3569.

ME 3580 Statistical Thermodynamics (4QH)

(formerly 02.904)

Spring Quarter, Odd Years

This is an introductory course in statistical thermodynamics for Mechanical Engineers designed to provide insight into the laws of classical thermodynamics and the behavior of substances. Topics to be covered include: Introduction to probability; elementary kinetic theory of an ideal gas including the distribution of molecular velocities and the mean free path treatment of transport properties; classical statistics of independent particles, equipartition of energy, the partition function and laws of thermodynamics; some results from quantum mechanics, quantum statistics of independent particles; applications to gases; introduction to ensembles and systems of interacting particles. This material is also contained in the two 2QH courses ME 3581 and ME 3582. Prep. ME 3100 and ME 3200 or equivalent.

ME 3581 Statistical Thermodynamics I (2QH)

(formerly 02.904)

As Announced

ME 3581 and ME 3582 present the same material with the same prerequisites as ME 3580 but in two 2QH courses.

ME 3582 Statistical Thermodynamics II (2QH)

(formerly 02.904)

As Announced

Continuation of ME 3581. Prep. ME 3581.

ME 3584 Fundamentals of Combustion (4QH)

(formerly 02.927)

Spring Quarter, Even Years

Comprehensive treatment of the problems involved in the combustion of liquid, gaseous, and solid fuels in both laminar and turbulent flow. The fundamentals of chemical kinetics will be discussed. The equations for the transport of mass, momentum, and energy with chemically reacting gases will be examined. Topics will include diffusion and premixed flames, combustion of droplets and sprays, and gasification and combustion of coal. This material is also presented in the two 2QH courses ME 3585 and ME 3586. Prep. ME 3200.

ME 3585 Fundamentals of Combustion I (2QH)

(formerly 02.927)

As Announced

ME 3585 and ME 3586 present the same material as ME 3584, with same prerequisites, but in two 2QH courses.

ME 3586 Fundamentals of Combustion II (2QH)

(formerly 02.927)

As Announced

Continuation of ME 3585. Prep. ME 3585.

ME 3600 Advanced Physical Metallurgy III (2QH)

(formerly 02.956)

Spring Quarter, Odd Years

The kinetics of phase transformations in metals. Topics include kinetic theory, empirical kinetics, diffusion in metals, nucleation, diffusional growth, martensitic transformations. Prep. A recent introductory material science course.

ME 3601 Thermodynamics of Materials III (2QH)

(formerly 02.963)

Spring Quarter, Odd Years

The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-solid systems, etc., plus kinetics of reactions and dynamic systems analysis. Prep. ME 3260 or ME 3261.

ME 3602 Materials Science and Engineering III (2QH)

(formerly 02.972)

Spring Quarter, Even Years

Continuation of ME 3271 plus a discussion of various special topics that will vary from year to year. Examples are: metastable phases and thin films. Prep. ME 3271.

ME 3603 Corrosion (2QH)

As Announced

This course will commence with the study of the thermodynamics of corrosion and corrosion reactions both in aqueous and non-aqueous environments. Topics will include thermodynamics, kinetics, and the effects of environment and physical metallurgy. Applications will be made to automotive design, and exterior and interior structures. Prep. Admission to the Graduate School of Engineering.

ME 3604 Oxidation (2QH)

As Announced

This course will begin with the study of the thermodynamics of oxidation and the effect of environment on rates of oxidation. Topics will include thermodynamics, kinetics, mechanisms, and effect of environment. Ferrous and non-ferrous metals as well as polymers will be assessed. Prep. Admission to the Graduate School of Engineering.

ME 3605 Electronic Materials I (2QH)

Fall Quarter, Odd Years

Generic techniques for fabrication and processing, and the resulting structure-property relationships, are presented for materials utilized in electronics. Typically included are: bulk single crystals, thin films, metals, semi-conductors, and insulators. Prep. ME 3271.

ME 3606 Electronic Materials II (2QH)

Winter, Odd Years

Continuation of ME 3605. Prep. ME 3605.

ME 3610 Introduction to Diffraction Methods in Material Science (2QH)

(formerly 02.975)

Fall Quarter

General principles of the diffraction by materials of short wave length radiations; (such as x-ray, electrons, and thermal neutrons) are studied with emphasis on the understanding of the similarities and differences of the different radiations when applied to the study of the structures of crystalline and non-crystalline materials. Prep. A recent introductory material science course.

ME 3611 Diffraction Methods in Material Science (2QH)

(formerly 02.976)

Winter Quarter

Continuation of ME 3610 with emphasis on the experimental methods and applications. This includes: choice of radiation, introduction to instrumentation, sample preparation, methods of detection and recording of the diffracted radiation, analysis, interpretation and use of the results. Prep. ME 3610.

ME 3612 Microstructure Analysis I (2QH)

Fall Quarter, Even Years

Discussion of the principles of scanning and transmission electron microscopy. Image interpretation in transmission electron microscopy with emphasis on the study of the relationships between microstructure and properties of materials. Application of kinematical and dynamical theories of electron diffraction to quantitative analysis of point defects, dislocations, precipitates and grain boundaries etc.. Laboratory demonstration of TEM and SEM operation. Prep. Admission to the Graduate School of Engineering.

ME 3613 Microstructure Analysis II (2QH)

Winter, Even Years

Continuation of ME 3612. Prep. ME 3612.

ME 3620 Powder Metallurgy (2QH)

(formerly 02.985)

Spring Quarter, Even Years

Powder characteristics and methods of manufacture. Powder pressing: packing, interparticle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. Prep. A recent introductory material science course.

ME 3625 Physical Ceramics I (2QH)

(formerly 02.965)

Fall Quarter, Even Years

Introduction to ceramic fabrication processes. Characteristics of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting micro-structure of ceramics. Prep. A recent introductory material science course, physical chemistry or solid state physics.

ME 3626 Physical Ceramics II (2QH)

(formerly 02.966)

Winter, Even Years

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. Prep. ME 3625.

ME 3630 The Structure and Properties of Polymeric Materials I (2QH)

(formerly 02.958)

Fall Quarter, Even Years

Introduction to the organic chemistry of polymers, effect of chemical composition on structure, melting point and glass transition temperature, polymer characterization and degradation, thermodynamics of polymers. Prep. Undergraduate material science course.

ME 3631 The Structure and Properties of Polymeric Materials II (2QH)

(formerly 02.959)

Winter, Even Years

Rheology and mechanical behavior of polymers, analysis and testing, effects of processing on structure and physical properties, industrial polymers, resin base composites. Prep. ME 3630.

ME 3640 Computer Modeling of Materials Processing (2QH)

Fall Quarter, Even Years

This course focuses on the use of numerical methods for modeling a variety of materials processes, e.g. melting, oxidation, reduction, the blast furnace, the cupola, rolling, extrusion. Prep. Admission to the Graduate School of Engineering.

ME 3641 Computer Modeling of Materials Properties (2QH)

Winter, Even Years

Various mathematical techniques and computer methods will be used to develop models that describe the changes in a material's chemical, mechanical, and physical properties as the chemical composition and metallurgical variables are changed. Prep. Admission to the Graduate School of Engineering.

ME 3797 Engineer Degree Continuation (0QH)

Any Quarter

ME 3798 Master's Degree Continuation (0QH) (formerly 02.9X1)	Any Quarter
ME 3799 PhD Continuation (0QH)	Any Quarter
ME 3850 Special Problems in Mechanical Engineering (2QH) (formerly 02.992)	Any Quarter
Theoretical or experimental work under individual faculty supervision. Prep. Consent of department faculty.	
ME 3853 Special Topics in Mechanical Engineering (2QH) (formerly 02.993)	Any Quarter
Topics of interest to the staff member conducting this class are presented for advanced study. Prep. Permission of department faculty.	
ME 3854 Special Topics in Mechanical Engineering (4QH)	Any Quarter
Topics of interest to the staff member conducting this class are presented for advanced study. Prep. Permission of department faculty.	
ME 3856 Doctoral Reading (2QH) (formerly 02.994)	Any Quarter
Material approved by the candidate's advisor (only S or F grades will be assigned for this course). Prep. Passing of PhD Qualifying Exam.	
ME 3860 Thesis (Master of Science Degree) (6QH) (formerly 02.991)	Any Quarter
Analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. First-year students must attend a graduate seminar program which will introduce the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Successful completion of the seminar program is required. Prep. Admission to the Graduate School of Engineering.	
ME 3861 Thesis (Master of Science Degree) (4QH)	Any Quarter
Analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. First-year students must attend a graduate seminar program which will introduce the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Successful completion of the seminar program is required. Prep. Admission to the Graduate School of Engineering.	
ME 3862 Thesis (Master of Science Degree) (2QH)	Any Quarter
Analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. First-year students must attend a graduate seminar program which will introduce the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Successful completion of the seminar program is required. Prep. Admission to the Graduate School of Engineering.	
ME 3870 Thesis (Mechanical Engineer Degree) (10QH) (formerly 02.996)	Any Quarter
Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. Prep. Admission to the Mechanical Engineer Degree Program.	
ME 3871 Thesis (Mechanical Engineer Degree) (4QH)	Any Quarter
Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. Prep. Admission to the Mechanical Engineer Degree Program.	
ME 3872 Thesis (Mechanical Engineer Degree) (2QH)	Any Quarter
Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. Prep. Admission to the Mechanical Engineer Degree Program.	

ME 3880 Dissertation (PhD Degree) (OQH)
(formerly 02.995)

Any Quarter

Theoretical and experimental work conducted under the supervision of the department. Open to day students only. Prep. Admission to the Doctoral Program in Mechanical Engineering.

ACADEMIC POLICIES AND PROCEDURES

A. Course Registration and Withdrawals

1. Program Approvals
2. Course Selections (Minimum Number of Courses; Choosing Courses)
3. Thesis Continuation
4. Registration Procedures
5. Course Withdrawal Procedures
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B. Grading System

C. Academic Standards and Degree Requirements

1. Academic Classifications
2. Academic Requirements
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D. Administrative Procedures

1. Change in Major
2. Change in Status (Classification)
3. Course Substitution
4. Course Waiver
5. Non-Graduate Engineering Courses
6. Thesis
7. Time Limit Extension
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A - Course Registration & Withdrawals

A1 - Program Approvals

The curricula of the degree programs are given under each department heading. Descriptions of courses are given so that students may obtain a general view of the course coverage. Preparatory courses are indicated to students upon their acceptance. Not all courses are offered every year, but the courses are arranged in such a manner that students may make continuous progress toward their degree. The Graduate School of Engineering issues a circular close to July 1st which gives the expected course offerings for the following academic year and the times at which they will meet.

At the time of Fall Orientation, each full-time student must develop, with the assistance of his or her faculty advisor or the Department's assigned Graduate Officer, a complete program of study. Any subsequent changes must be approved by the advisor or the Department's assigned Graduate Officer. The Graduate School of Engineering makes available Advisor Sheets for program planning. These sheets are to be completed and a copy submitted to the Graduate School before a full-time student may proceed with his or her registration.

A2 - Course Selections

Minimum Number of Courses Required

Part-time students may register for a maximum of six (6) quarter hours per quarter.

Full-time students on Parallel Co-op should register for a minimum of eight (8) quarter hours per quarter in order to maintain their full-time status. Continuous Full-time and Alternating Co-op Students must maintain twelve (12) to sixteen (16) quarter hours per quarter for continuous progress toward their degree. Graduate Assistants should maintain at least eight (8) quarter hours per quarter for full-time status and the assistantship appointment. International Students on an F-1 or J-1 student visa must maintain full-time course loads as outlined above. The only exception to the minimum courseload for full-time status is if a student is in his or her last academic quarter or has completed all degree requirements and is registered in thesis continuation.

Choosing Courses

In selecting courses, full-time students should follow their advisor's or the Department's assigned Graduate Officer's approved schedule. Part-time students should follow the outlines presented in the department program section and confer with their advisor or the Department's assigned Graduate Officer for additional assistance as needed.

Courses, other than core courses, are offered according to the demand and the availability of faculty for specific areas. The student should preselect courses whenever possible and plan to take them when offered, maintaining flexibility with alternate courses in mind. There is no guarantee that any particular course will be offered, but the Graduate School of Engineering will do everything possible to assure continuity of programs.

To register for a course offered by a Graduate School at Northeastern other than Engineering, approval from the Graduate School of Engineering must be obtained before a student can petition the other graduate program. Refer to Administrative Procedures under the "Non-Graduate Engineering Courses" section.

Those students who need assistance in course selection, course sequencing, waivers and transfer credits should contact their advisor or the Department's assigned Graduate Officer or the Graduate School of Engineering. Additional information is provided under Administrative Procedures.

A3 - Thesis Continuation

Students who have not completed their thesis after having registered for the specified number of thesis credits must register for Thesis Continuation each subsequent quarter during the academic year until the thesis is completed. Thesis continuation carries no credit, but will appear on the student's transcript along with the appropriate grade for each quarter of registration. The continuation fee is one-half the tuition cost of one quarter hour for Master of Science and the cost of one quarter hour for Doctoral Degrees and Doctor of Engineering. Students who fail to register for Thesis Continuation will be charged retroactively at the time of degree conferral for any quarters in which they did not register and pay for their continuation fee.

A4 - Registration Procedures

Registration is mandatory. Any student who has failed to register properly before the end of the fifth week of classes will not receive a grade at the end of the quarter, even if the coursework was completed.

Engineer Degree, PhD and DEng students must register for course work or dissertation as approved by their advisors or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Doctoral students must be registered for dissertation during the quarter in which they take the final oral examination.

Mail registration is available for all regularly scheduled courses in all academic quarters. Materials are mailed at least four weeks prior to the quarter to all currently active students with the exception of Special Students. The forms should be completed and returned as soon as possible to the Registrar's Office. Course entrance is granted on a first-come, first-serve basis, and past experience indicates that many courses close-out early in the registration process.

For adding or dropping courses following the mail registration period, students must go to the physical registration site to complete add/drop forms. In addition there is a late registration period during the first week of classes at which further changes may be made.

Students planning to graduate within the calendar year are required to complete the pink Commencement Card available in the Registrar's Office and at all registration sites, and file no later than the beginning of the quarter prior to graduation.

A5 - Course Withdrawal Procedures

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. In unusual circumstances, the Registrar's Office may be informed by letter. Withdrawals may be made through the ninth week of the quarter. However, withdrawals which are made after the fifth week of the quarter will be recorded with a "W" on the student's transcript.

Ceasing to attend a class, or simply notifying the instructor of intention to withdraw, does not constitute an official withdrawal. Students will be charged for the course tuition and will be subject to grades of "I" or "W" should they fail to officially withdraw.

Tuition refunds are granted only on the basis of the date on which the form is filed with the Registrar's Office. Students should keep their copy of the course withdrawal form to avoid any possibility of error. The Bursar's Office will credit a student's account or refund tuition in accordance with the following schedule:

<u>Official Withdrawal Filed Within</u>	<u>%Tuition Refunded</u>
First week of quarter	100%
Second week of quarter	75%
Third week of quarter	50%
Fourth week of quarter	25%

Requests for withdrawal from a course after the ninth week of the quarter may be submitted in writing to the Director of the Graduate School, and may be approved to avert unusual hardships on a student.

A6 - Common Registration Problems and Policies

Students who have pre-registered by mail will receive notification from the Registrar's Office in the event any selected course has been filled. The student must attend physical registration to register for an alternative course. However, if the closed course notification is received before physical registration, the student may call the Registrar's Office and verbally request that the course be replaced with the alternative course.

Class sizes are controlled by the Registrar and set by the Director of The Graduate School of Engineering in conjunction with the departments. The number of students enrolled in each class is limited to permit effective teaching at the graduate level. The University reserves the right to cancel, postpone, combine, or modify any course.

To register properly for any closed course, a student must obtain a "Permit to Register" card from the Graduate School of Engineering and submit the card at a scheduled registration. All appeals to enter a closed course must be submitted to the Director of the Graduate School for approval. Such permission is granted in cases where 1) the student has a prospective date of graduation the following June, the course is essential to his or her program, and the course cannot be taken in any of the following quarters, or 2) the student has successfully completed the first part of a sequential course. The addition of the student's name to the class list by the instructor does not constitute registration and will not entitle the student to a grade even if all the coursework is completed.

Due to last minute scheduling changes occasionally the Graduate School will substitute faculty or change times for the class meetings after registration has begun. Any student who initially registered for the original course will automatically be registered for the new version should no major schedule conflicts be apparent. Otherwise, all registered students will be contacted for alternatives. Wherever possible, the Graduate School will attempt to satisfy these students' first options. Once the student has received notification of a time change and when the alternative results in a schedule conflict the student is responsible for making any registration changes.

Graduate Assistants must follow standard procedures for registering, dropping and adding courses. Registration conflicts with regard to work or teaching schedules must be resolved by the Graduate School and not the Registrar's Office.

Students are asked not to register for an excessive number of courses or double sections with the intention of dropping half or more of the courses during the first week of classes. "Double Section" requests will not be processed by the Registrar's Office. Over-registering complicates course and room scheduling, closes courses prematurely to genuinely interested students, and increases the number of changes and thus the chance of error. Students who abuse the registration process will jeopardize their program status.

Course credits earned in the Graduate School of Engineering are valid for a maximum of seven years in the Master of Science degree program, and up to five years in the Engineer Degree and PhD programs (once PhD degree candidacy has been established). (Refer to the Administrative Procedures section).

All students who change their address, name or phone number during their enrollment in the Graduate School of Engineering should inform the Registrar and Graduate Engineering Office separately and in writing.

Any student who is financially withdrawn prior to the start of any given quarter must clear his or her financial obligation by the end of the fifth week of the quarter in order to receive academic credit. No grades will be processed for any student who remains financially withdrawn after the fifth week of any given quarter.

A7 - Student I.D. Cards and Parking Stickers

Part-time students will receive ID's in the mail approximately the second week of classes. If the ID card is lost, a replacement may be obtained through the Registrar's Office.

Full-time students receive photo ID cards during the Fall Orientation week; these are validated with the sticker the student may obtain from the Registrar's Office during the second week of each quarter that he or she is registered.

Parking stickers are obtained from the Traffic Office or the Suburban Campus Office by submitting a Cashier's payment card, car registration, driver's license and proof of registration (ID card or facsimile). Parking space is available on a first-come, first-served basis.

B - Grading System

The student's performance in graduate courses will be graded according to the following numerical equivalents.

A	(4.000)	This grade is given to those students whose performance in the course has been of very high graduate caliber.
A-	(3.667)	
B+	(3.333)	
B	(3.000)	This grade is given to those students whose performance has been at a satisfactory level.
B-	(2.667)	
C+	(2.333)	
C	(2.0)	This grade is given to those students whose performance in the course is not at the level expected in graduate work.
C-	(1.667)	
F	(0)	This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I	Incomplete	This grade is given to those students who fail to complete the work of the course; this work must be completed within one calendar year.
W	Withdrawal	This grade is given to those students who were officially registered at the end of the fifth calendar week of a quarter and then officially withdrew from the class.
L	Audit	This grade is given to those students who were officially registered to audit the class.
S	Satisfactory	These grades are given to those students officially registered in Thesis courses or Thesis Continuation.
U	Unsatisfactory	A grade is submitted when the Thesis is successfully completed.

Individual faculty members may choose not to use the plus and minus designations. If they elect to use the whole letters only, they must announce this to the class at the beginning of the quarter.

C - Academic Standards and Degree Requirements

C1 - Academic Classifications

Students initially entering the Graduate School are classified into one of three groups according to their admission qualifications:

1. Regular students are those who meet in full all admittance criteria based on the standards established by the Committee on Graduate Study in Engineering.

2. Provisional students are those who do not qualify for regular admission based on the standards established. In order to continue in the Graduate School of Engineering and be reclassified as a regular student, a provisional student must obtain a 3.00 grade point average in their first twelve quarter hours of course work.

3. Special students are placed in a non-degree status and are limited to a maximum of twelve quarter hours of graduate credits.

C2 - Academic Requirements

All students must satisfactorily complete an approved program of correlated work of graduate caliber and such other study as may be required by the department in which he or she is registered. Regardless of classification, any student whose record is not satisfactory may be withdrawn from the Graduate School of Engineering.

To qualify for any degree from the Graduate School of Engineering a student must have a grade point average of not less than 3.00 with no more than 12 credits below a B- in all courses applied towards the degree, exclusive of pre-requisite courses. The Committee on Graduate Study in Engineering allows eight quarter hours of credit to be taken beyond the stated degree requirements, to repeat failed required courses or substitute for elective courses to obtain the required 3.00 average for completion of degree requirements.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C- or better.

C3 - Auditing Classes

Students who wish to audit a course must indicate this preference at registration. While no credit will be given for an audit, audits do appear on the student's transcript. Registration changes from an audit to a graded status in a course may not be made after the first day of classes.

C4 - Changes in Requirements

The continuing development of the Graduate School forces frequent revision of curricula and in every new bulletin some improvements are indicated. Students are held to the requirements in the bulletin of the year in which the student matriculated. However, they may elect to pursue the revised program requirements upon departmental approval.

C5 - Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is roughly equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for two, six-week periods. The academic calendar in the Graduate Student Handbook should be consulted for the opening and closing dates of each academic quarter.

C6 - Code of Student Conduct

The Graduate School of Engineering will take immediate disciplinary action in all cases where a student has failed to adhere to the University rules and regulations for proper student conduct. Cheating, fabrication, facilitating academic dishonesty, and plagiarism are considered violations which may result in immediate dismissal from the Graduate Engineering program. Students should refer to the University Graduate Student Handbook for additional information.

C7 - Continuity of Program

Students are expected to maintain continuous progress toward their intended degree. A student who has attained 8 quarter hours of incomplete (I) grades and/or withdrawals may, at the discretion of the Committee on Graduate Study in Engineering, be withdrawn for failure to show continuous progress toward the degree.

C8 - Filing for the Degree

Each student who plans to graduate either in June or September must submit to the Graduate Registrar's Office a completed commencement data card prior to the deadline listed in the academic calendar for that commencement at which he or she expects to receive the degree. If the deadline for filing is not met, there is no assurance that the degree will be awarded that year. The commencement data card is supplied with the registration materials or is available in the Graduate Registrar's Office. It is, of course, the student's responsibility to make sure that degree requirements have been met, subject to confirmation by the Graduate School of Engineering.

C9 - Incomplete Grades

The I grade will be changed to a letter grade when the deficiency which led to the I is corrected to the satisfaction of and in the manner prescribed by the instructor in the course. The period for clearing such a grade will be restricted to one calendar year from the date of its first being recorded on the student's permanent record.

C10 - Prerequisite/Advanced Undergraduate Courses

Prerequisite courses will not be given credit towards degree requirements unless expressly clarified by the individual departments. Advanced undergraduate courses are sometimes approved for degree credit. A request must be made on a graduate engineering petition form and submitted to the Graduate Engineering office for approval. (See the Administrative Procedures section). The maximum number of credits allowed is determined by each academic department and are specified under the course descriptions for each department.

C11 - Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven academic years in the Master of Science degree programs, up to five years in the Engineer Degree programs, and up to five years in the PhD and DEng programs once degree candidacy has been established. (Refer to Administrative Procedures section under "Time Limit Extension" petitions).

D - Administrative Procedures

D1 - Change in Major*

A change of major area of concentration within the same department can be done on a petition form obtained from the Graduate Engineering office. The completed petition, along with an unofficial transcript of your graduate work, should be presented to your advisor or the Department's assigned Graduate Officer for his or her approval. All of these materials are then filed with the Graduate Engineering office for final approval and changing of your major code with the Registrar's Office.

D2 - Change in Status*

A change of status from full-time to part-time in the same program can be done by filing a completed petition with the Graduate Engineering office. No advisor's signature is needed. Students on an F-1 or J-1 visa cannot request part-time status due to immigration regulations. If you are having academic difficulties, the Graduate Engineering School will recommend a remedial course of action for you.

To change status from part-time to full-time in the same program, you will need to have completed a minimum of 12 QH with at least a 3.0 grade point average. Present a completed petition and unofficial graduate engineering transcript to your advisor or the Department's assigned Graduate Officer for approval. All of these materials are then filed with the Graduate Engineering office for final approval and changing of your status code with the Registrar's Office.

*Please Note: a change of major or status into a different department requires a re-application process. This can be done by requesting, preferably in writing, the Graduate Engineering office to bring your file before the new department's Admission Committee for review. An unofficial graduate engineering transcript, and any other materials needed, should be provided by you to the Graduate Engineering office.

D3 - Course Substitution

A course substitution is the replacement of a graduate level course already taken with an equivalent graduate level course. The Registrar's Office will automatically designate "Repeat" by a course when you retake the same exact course. However, when a two-part sequence (as offered in the evenings) is taken to replace the four quarter hour day course equivalent, a special request from the Graduate Engineering office has to be made to the Registrar's Office. In order to have "Substitution" noted by the course on your transcript, you need to file a completed petition with an unofficial transcript and your advisor's or the Department's assigned Graduate Officer's approval with the Graduate Engineering office who will then notify the Registrar.

Please Note: There is an eight quarter hour limitation on the number of courses you can repeat or substitute. Also, when the notation of "Repeat" or "Substitute" is beside a course on your transcript, the course's quarter hours and grade are no longer calculated into our overall grade point average.

D4- Course Waiver

A course waiver is the replacement of a required course not yet taken in your degree program with an alternative course. To do this, submit a completed petition and unofficial transcript, with the reason for your request, to your advisor or the Department's assigned Graduate Officer for approval. Then, file all materials with the Graduate Engineering office for final approval. The petition is retained in your file for graduation review purposes.

D5 - Non-Graduate Engineering Courses

To request that an advanced undergraduate engineering course be applied to your graduate degree program, you will need to submit a completed petition with your advisor or the Department's assigned Graduate Officer's approval, and an unofficial transcript of both the undergraduate course (if already taken) and your graduate courses to the Graduate Engineering office. If approved, the course and its grade will be used toward your graduate degree requirements.

In order to receive credit for graduate courses at Northeastern outside of the School of Engineering, you will need to obtain approval from the Graduate Engineering office. Submit a completed petition with your advisor's or the Department's assigned Graduate Officer's approval and an unofficial transcript to the Graduate office. Then, if approved, bring your copy of the petition to the graduate school in which the desired course is offered. Usually, you will need to complete a different type of petition for that graduate school at least four weeks prior to the quarter in which the course is being offered. Your copy of the Graduate Engineering petition is verification of approval, and will designate if the non-engineering graduate course is to be applied toward your degree.

Interdisciplinary degree students are not required to follow this procedure when the courses are considered part of the degree program.

Please Note: graduate courses taken in another college at Northeastern, if approved for de-

gree credit, are granted on a course-for-course equivalency and the grade is calculated into your overall grade point average.

D6 - Thesis

Instructions for the preparation of a thesis are available from the Graduate School office, and include proper formatting and procedures for depositing the thesis in Dodge Library. The thesis topic is developed with your advisor and the final thesis is approved in accordance with the regulations of the Graduate School of Engineering outlined in the instructions.

D7 - Time Limit Extension

If you come to a point in your graduate work where it becomes evident that you cannot complete your program within the time limit (seven years for Master of Science degree, five years for Engineer degree and PhD candidates), you will need to request approval for a time extension from the Department Graduate Committee. This requires that 1) a completed petition, with your advisor's or the Department's assigned Graduate Officer's approval, 2) an unofficial graduate engineering transcript, and 3) a letter from you stating the reasons for the request, are on file. Your letter, addressed to the Department Graduate Committee, should also state the specific course of action you plan to take in order to complete your degree requirements, and the length of time needed for the extension. If the extension is approved, all materials are placed in your file for graduation clearance purposes.

D8 - Transfer Credit

The Graduate School of Engineering allows up to twelve (12) quarter hours of credit obtained from another institute to be used toward the Master of Science degree. To be eligible for transfer credits, the course(s) must be 1) in the student's field of study, 2) at the graduate level, 3) in a recognized college or university, and 4) carry grades of B or better. The credits cannot have been used toward any other degree and must have been taken within the time limit for your degree completion. Once entered in the program, a student wishing to take a course for transfer credit should petition for approval prior to pursuing the course.

If you are seeking transfer credit approval, you will need to complete a petition, and provide an unofficial transcript of your graduate work at Northeastern, a course catalog description and official transcript of the course you wish to transfer. Submit all of these materials to the Department Graduate Committee. If approved, the material is sent to the Graduate School Office. The credits will be applied toward your degree requirements if all transfer credit criteria have been met. However, the grades do not carry over and are not included in the computation of your grade point average required for degree completion. Credits are granted as equivalent to required or elective courses in the Graduate School of Engineering.

UNIVERSITY FACILITIES AND RESOURCES

In 1910, Northeastern University began new construction on the first piece of land acquired at its present Huntington Avenue site. Since those early days, the central Boston campus has grown to occupy over 50 acres of land located in close proximity to such cultural landmarks as Symphony Hall, the Museum of Fine Arts, the Isabella Stewart Gardner Museum, Horticultural Hall, and the Boston Public Library, among others. The University is within walking distance of Fenway Park, Copley Place, the Back Bay shopping district, and a number of renowned hospitals, including Brigham and Women's and other Harvard teaching hospitals.

In addition to sixteen suburban campus and branch locations, and several off-campus athletic facilities, Northeastern University maintains a variety of affiliations that provide its students access to facilities and specialized equipment at other institutions or organizations.

The Boston Campus

The central Boston campus is built around a quadrangle, one side of which faces Huntington Avenue, a major artery dividing the campus. The buildings surrounding the quadrangle characterize the urban design of the campus, and the innovative design of new buildings that have been added in recent years has maintained an architectural theme that is both attractive and functional.

The campus itself has been planned to provide easy access to classrooms, laboratories, and administrative offices through a series of connected walkways and a network of underground corridors providing routes that are especially convenient during periods of inclement weather. As the University continues to expand, parking and recreational areas are integrated into the campus along with new academic facilities.

Suburban Facilities

Northeastern University's five suburban campuses provide administrative and classroom facilities for the University's graduate, adult and continuing education programs as well as the environment necessary for specific programs of study that could not be accommodated in an urban area.

The Warren Center provides a practical laboratory in outdoor education and conservation, and in camping administration, programming, and counseling. It also offers a summer camp-site for various community and University groups and activities and is available as a conference and workshop site.

The Marine Science and Maritime Studies Center is located in the Nahant, on Massachusetts Bay 20 miles northeast of Boston and serves as a site for national and international as well as University research.

Henderson House is Northeastern University's conference center. Located 12 miles from Boston in suburban Weston, Henderson House hosts a variety of round-the-clock activities including residential seminars, workshops, short courses, and weekend meetings.

The Suburban Campus located in Burlington is near the junction of Routes 128 and 3. Graduate courses in engineering, business administration, and education as well as undergraduate courses for part-time students are offered here. The Burlington Campus also offers special programs for adults and noncredit continuing education courses.

Another Northeastern University facility is the Botanical Research Station in Woburn, which contains a small arboretum and a spacious greenhouse used for propagation and research.

One of the most recent campus acquisitions is the 20-acre Dedham Campus, just north of Route 128. This recently renovated facility provides space for the College of Business Administration's new High Technology MBA program, and offices for the Center for Continuing Education.

University Libraries

The University Libraries include seven units. On the Boston campus, there is the main facility Dodge, and three libraries that house graduate-level collections; Chemical and Biomedical Sciences, Mathematics/Psychology, and Physics/Electrical Engineering. There are also three libraries located on the Burlington and Dedham campuses and at the Marine Science and Maritime Studies Center in Nahant.

The total holdings of the University Libraries include the equivalent of more than one million volumes in print and in microform, 5,000 periodical titles, 300,000 government documents and 24,000 items in audiovisual and computer software formats.

In the main library, the Learning Resources Center provides computer-assisted-instruction, microcomputer facilities, and language and music listening laboratories. Also housed in the Center is an extensive set of self-paced media materials, in varied interactive formats, including audiotapes, videotapes, and computer-assisted lessons and exercises.

Libraries provide reference assistance and instruction on strategies for bibliographic research. On-line literature searches are conducted, for a fee, by librarians in Computer Search Services. Individual conferences may also be arranged with a librarian to discuss particular or specialized research needs. A series of publications, prepared by the library staff, are available to acquaint students with library collections and services.

Should needed materials not be in the collections of the University Libraries, staff will assist you in identifying other libraries that own a particular title. Requests to borrow books and other materials or to obtain photocopies of articles from other libraries are handled through Interlibrary Loan.

The University's membership in the Boston Library Consortium generally allows Northeastern University students on-site use of consortium libraries at the following institutions: Boston College, Boston Public Library, Boston University, Brandeis University, MIT, State Library of Massachusetts (Amherst, Boston and Worcester campuses), and Wellesley College. Borrowing privileges may also be granted to graduate students who hold a consortium card.

Academic Computer Services

Academic Computer Services supports research activities of faculty, research personnel, and graduate students, as well as teaching and learning activities at both the graduate and undergraduate levels. The computational capability of this facility includes 270 assorted personal computers linked in local area networks at the Boston, Burlington and Dedham campuses. A wide area network also provides both students and faculty with time-sharing access to five large computers through video and hard-copy terminals arranged in clusters at all three campuses. The wide area network connects three Digital Equipment Corporation VAX-11/780 systems in Richards Hall plus an additional VAX 11/785 and a Data General MV/8000 in the Engineering Computer Center. This network also provides access through a number of dial-in computers. A variety of graphics and output devices are also available. Effective utilization of all facilities is promoted by availability of programming assistance at all three campuses.

Electronic spreadsheet and word processing packages are available, as well as numerous software libraries for numerical, statistical and financial applications. The primary languages supported for those who choose to do their own programming are FORTRAN, COBOL, BASIC, PASCAL, and Assembler.

Graduate Student Housing

Full-time graduate students enrolled in a graduate program may reside in a University apartment facility. Assignments are made on a first-come, first-serve basis after an application and deposit are received. There are no accommodations for married students in university housing. The University also maintains listings of off-campus rooms and apartments.

Department of Career Development and Placement

The Department of Career Development and Placement offers a wide range of counseling and placement assistance to all seniors, graduate students and alumni of Northeastern University seeking employment, to undergraduates seeking admission to graduate or professional school; and to students interested in participating in nonpaid, part-time internships in private or public nonprofit agencies for which they may receive academic credit.

Through this department, representatives of hundreds of employers are scheduled to visit the campus each year to interview seniors and graduate students for full-time employment after graduation. A job bank of currently available positions is maintained for alumni who are seeking new opportunities for which they may be qualified. Credential service is provided for students and alumni seeking positions in the field of education and for applicants to graduate and professional schools. Regularly scheduled seminars are conducted for seniors, graduate students and alumni on career development, job-finding techniques, resume preparation and effective interviewing. Individual career counseling is available for seniors, graduate seniors and alumni of all University programs.

Sport, Dance and Exercise Facilities

Through its Cabot Center for Physical Education, Dockser Hall and Barletta Natatorium, Northeastern University offers a wide variety of specialized facilities, including basketball courts, dance studio, indoor athletic field and running track, gymnastics room, combatives room, weight-training rooms, swimming pool, crew practice tank, handball courts, and motor performance and exercise physiology laboratories. The Matthews Arena, with seating for more than 5,000 fans, provides home ice to the University's varsity and subvarsity hockey teams and, when the portable playing floor is down on the ice, home court to the University's basketball teams.

For organized athletics requiring facilities not available on the main campus, Northeastern maintains several off-campus locations, including the Northeastern Boat House, which is located on Memorial Drive in Cambridge and provides a home for the University's crew teams. The Edward S. Parsons Field, on Kent Street in Brookline, is the playing ground for the football, baseball, women's lacrosse and women's field hockey teams, tennis, and some intramurals.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, cafeteria with seating for more than 1,000 and the bookstore.

Lane Health Center

A comprehensive program of medical care is provided to all full-time graduate and undergraduate students. The University maintains a Health Services Clinic, which is open for emergencies at all times and is equipped to deal promptly with any medical condition that may arise. All entering full-time students must submit a pre-entrance physical examination form provided by the Lane Health Center prior to registration. Failure to fulfill this requirement can delay registration and result in a penalty fee and additional fee for a physical examination.

Counseling and Testing Center

Counseling and testing to aid a student or prospective student with career, educational, or personal concerns are available days and certain weekday evenings until 8:30 PM. Information and appointments may be obtained by calling 617-437-2142 or by visiting the Counseling and Testing Center.

Offices of Services for the Handicapped

Any student who has a disability-related special need, no matter how small or individual, can receive ready support services from the Office of Services for the Handicapped (OSH). Frequently, students are uncertain about how they may be aided by this office, and in these situations a discussion of possible alternatives can be quite helpful. OSH provides a wide range of support services to eliminate the competitive disadvantages that a disability may create. Services are individually tailored to meet the needs of each student.

The types of assistance available from the Office of Services for the Handicapped include orientation, registration and preregistration, information clearinghouse, counseling, housing, services for the visually-impaired, the hearing-impaired, the wheelchair user/mobility-impaired student, and learning disabled student.

The Office of Services for the Handicapped is also the gathering place for the Disabled Student Organization of Northeastern University, which works cooperatively with OSH to plan programs and improve accessibility of services for handicapped persons at Northeastern.

Network Northeastern

Network Northeastern represents the University's entry into the age of education by telecommunications. The Network utilizes the microwave-based Instructional Television Fixed Service (ITFS) system whereby educational services are broadcast directly to company sites and other remote locations within a 40-mile radius of Northeastern's Boston campus. With this service, live classroom instruction is telecast in color to remote sites where it is viewed in reception rooms equipped with TV monitors and a telephone-based talkback system. During presentation, off-campus students are able to participate as fully in the instruction as can students sitting in the originating classroom on campus. A courier service is provided to collect and deliver homework assignments, and to serve as the off-campus student's link to the bookstore, registrar, and other campus services.

Network Northeastern currently offers courses in graduate engineering, graduate computer science, undergraduate engineering technology, state-of-the-art professional development courses, and non-credit nursing courses. This instruction is telecast daily between 8:00 a.m. and 10:00 p.m. on four channels to off-campus students at twenty-two company sites and two suburban campuses.

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Academic Calendar 1986-87

Fall Quarter

	1986-87
Registration period	
Burlington 1-3 pm; 5:30-8:00 pm	Sept. 16-17
Boston 1-8:00 pm	Sept. 22-25
Classes begin	Sept. 29
Last day to drop a course	Nov. 26
Examination period	Dec. 15-19

Winter Quarter

Registration period	
Burlington 1-3 pm; 5:30-8:00 pm	Dec. 2
Boston 1-3 pm; 5:30-8:00 pm	Dec. 8-11
Classes begin	Jan. 5
Last day to drop a course	Mar. 6
Examination period	March 23-27

Spring Quarter

Registration period	
Burlington 1-3 pm; 5:30-8:00 pm	March 10
Boston 1-3 pm; 5:30-8:00 pm	March 16-19
Classes begin	April 6
Last day to file card for	
Spring Commencement	May 15
Last day to drop a course	June 5
Examination period	June 15-19
Spring Commencement	June 21

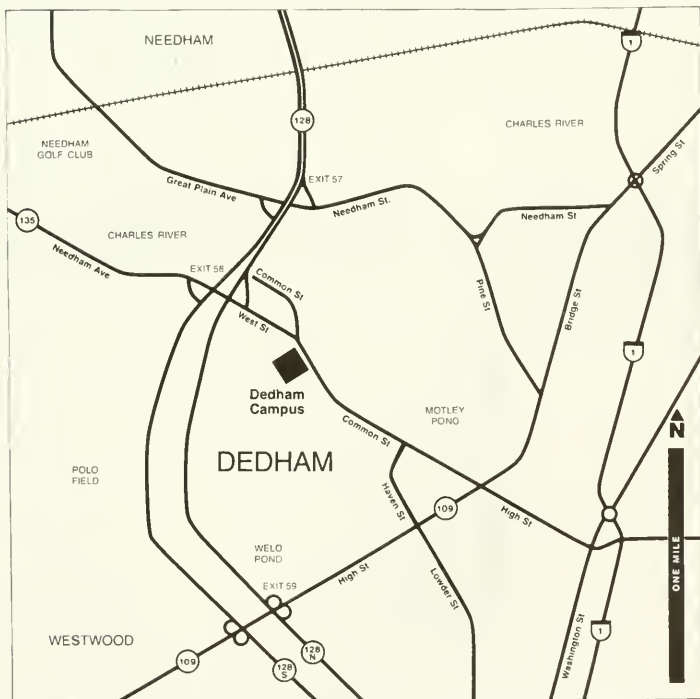
Summer Quarter

Registration period	
Burlington 5:30-8:00 pm	June 15-16
Boston 5:30-8:00 pm	June 17-18
Classes begin	June 29
Last day to file card for	
Fall Commencement	August 13
Last day to pay fee for	
Fall Commencement	August 20

Calendar changes may be made. The University Community will be notified if such changes are necessary.

University Holidays

	1986-87
Columbus Day	Monday October 13
Veterans Day	Tuesday November 11
Thanksgiving Recess	Thurs-Sun November 27-30
Christmas Vacation	Mon-Sun Dec 22 - Jan 4
Martin Luther King, Jr. Day	Monday January 19
Washington's Birthday	Monday February 16
Patriot's Day	Monday April 20
Memorial Day	Monday May 25
Independence Day	Saturday July 4
Labor Day	Monday September 7





Key

Academic, Residential,
and Service Buildings
Handicapped Parking
Handicapped Routes
Parking Areas
Public Buildings
Public Parks
Street Direction
Underground Tunnel

Maps are provided by the
Visitor Information Center
115 Richards Hall, extension 2736.
Some buildings on this map are used but
not owned by Northeastern University.
NUP 6.1.5

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere and the most congenial conditions it can provide. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state and from county to county. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Northeastern University's Antidiscrimination Policy

Northeastern University is committed to a policy of equal opportunity for all students and employees without regard to race, color, religion, sex, sexual preference, national origin, or handicap or veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance. Northeastern is also an equal opportunity employer.

Equal Opportunity Employment Policy

Northeastern University is an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or handicap or veteran status.

Northeastern University also prohibits discrimination against any employee regarding upgrading, demotion or transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training. In addition, Northeastern adheres to Affirmative Action guidelines in all recruitment endeavors.

Further, Northeastern will not condone any form of sexual harassment which is defined as the use of unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature: as an explicit or implicit condition of employment, as the basis for employment decisions or to interfere with an individual's work performance by creating an intimidating, hostile, or offensive work environment.

Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of the Rehabilitation Act of 1973, Affirmative Action Office, Richards Hall, 437-2133.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registrations of the University College and graduate schools.

Office of Services for the Handicapped

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Rehabilitation Act of 1973 are coordinated by the OSH director, 5 Ell Center, (617) 437-2675.

Northeastern University International Mission Statement

Northeastern University, a world leader in cooperative education, acknowledges the increasing interdependence among nations, and, therefore, identifies its mission as preparing its graduates to live and work in an interdependent world. To accomplish this goal, Northeastern University actively seeks qualified students from abroad to enroll in its undergraduate and graduate programs in such numbers and with such geographic origins so as to create and foster a truly global exchange of ideas and values among students, faculty and staff. The University also encourages all colleges to continually develop and expand course offerings to include international issues and cross-cultural aspects and supports faculty to teach and conduct research in the interrelationship among nations and peoples. In addition, the University promotes international understanding and the sharing of ideas with institutions throughout the world by virtue of its faculty and staff exchanges and its study and work abroad programs for students.

Accreditation Statement

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

Tuition and Fee Disclaimer

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM RADIO STATIONS WBZ (1030), WEEI (590), WHDH (850), WRKO (680), and FM stations WBCN (104.1), and WROR (98.5), are the stations authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

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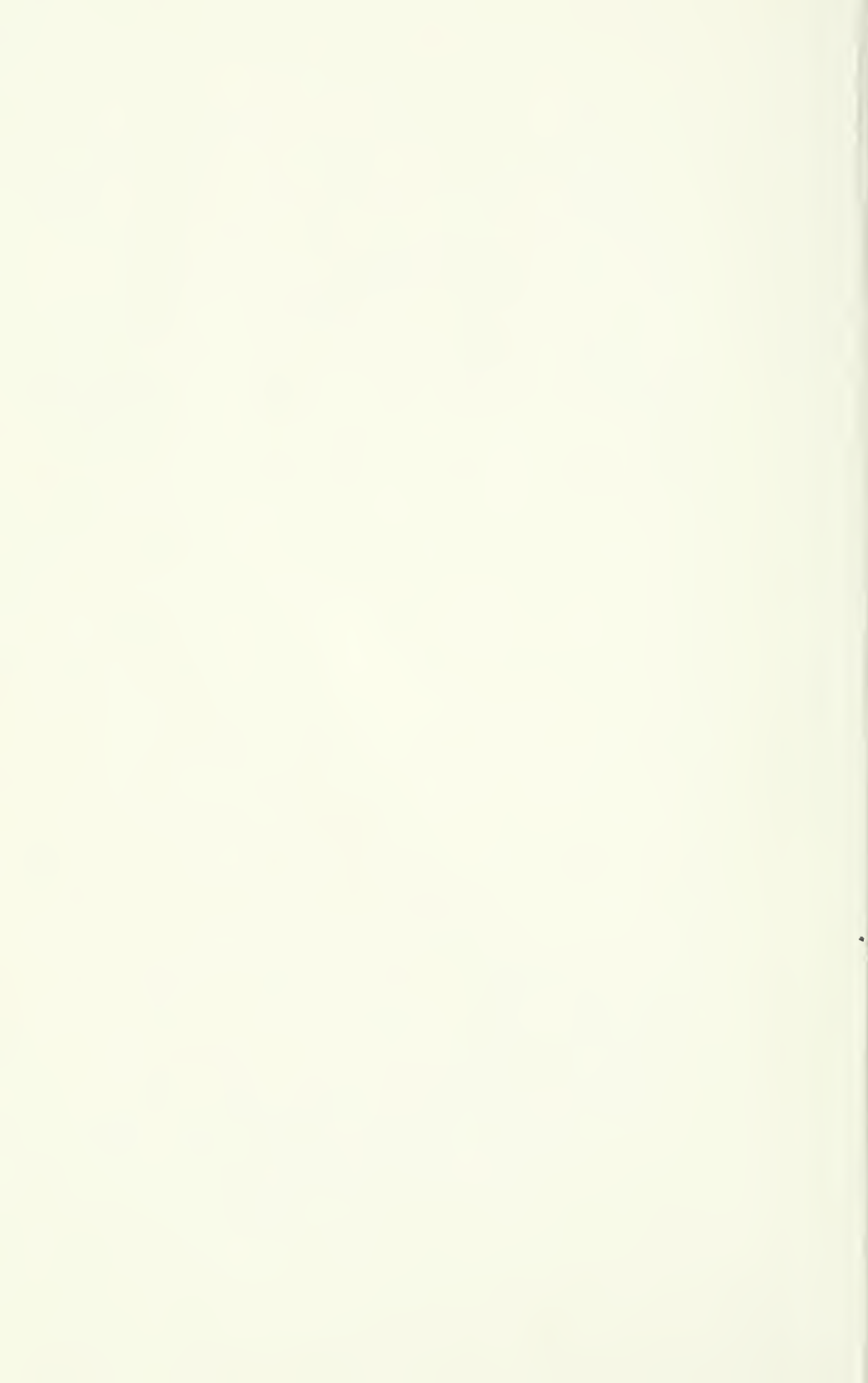
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Graduate Schools Course Descriptions

**Northeastern University
1986-1987**

Northeastern University

1986–1987

Graduate Schools Course Descriptions

Arts and Sciences

Business Administration

Boston-Bouvé College

of Human Development Professions

Professional Accounting

Computer Science

Criminal Justice

Engineering

Pharmacy and Allied Health Professions

Northeastern University charges tuition for all courses taken above the normal academic load.

The University reserves the right to make changes in the regulations and courses announced in this bulletin.

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Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere and the most congenial conditions it can provide. But the quality and rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience, but you are a partner in this venture with an obligation and responsibility to yourself.

Northeastern University's Antidiscrimination Policy

Northeastern University is committed to a policy of equal opportunity for all students and employees without regard to race, color, religion, sex, sexual preference, national origin, or handicap or veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance.

Equal Opportunity Employment Policy

Northeastern University is an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or handicap or veteran status. Northeastern also prohibits discrimination against any employee regarding upgrading, demotion or transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training. In addition, Northeastern adheres to Affirmative Action guidelines in all recruitment endeavors.

Further, Northeastern will not condone any forms of sexual harassment which is defined as the use of unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature: as an explicit or implicit condition of employment, as the basis for employment decisions or to interfere with an individual's work performance by creating an intimidating, hostile, or offensive work environment.

Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of the Rehabilitation Act of 1973, Affirmative Action Office, Richards Hall. Telephone: 617-437-2133.

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Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

The following is a list of courses offered by the graduate schools of Arts and Sciences, Boston-Bouvé College of Human Development Professions, Business Administration, Criminal Justice, Computer Science, Engineering, Pharmacy and Allied Health Professions, and Professional Accounting for the academic year 1986–1987.

To obtain course listings for the school of Law, please refer to the catalogue.

In order to register for courses outside one's graduate school, students *must* meet the requirements of the school offering the course(s) as well as their home school.

Students may not register for any courses outside their school unless the appropriate permit is presented at registration. Consult your graduate school office for details concerning these procedures.

Arts and Sciences

Graduate School of Arts and Sciences

Anthropology and Sociology

All courses carry three quarter-hours of credit unless otherwise specified.

Social Anthropology

Many undergraduate courses in the SOA 300 and 400 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

SOA 3100 Theory **4 Q.H.**

History of major contemporary orientations: evolutionary approaches, culture area, cultural ecology, functionalism, structuralism, and analysis of current status of these and related theories.

SOA 3101 Human Origins **4 Q.H.**

An examination of the data on fossil remains and on contemporary primates which are essential for understanding human physical and behavioral evolution.

SOA 3102 Evolution of Society **4 Q.H.**

The development of political and economic institutions beginning with foraging societies and the sexual division of labor: specialization, social stratification and the emergence of civilization.

SOA 3120 Visual Anthropology

Explores the anthropologist's use of film to gather information and analyze cultural subsystems. In addition to reading about and viewing films on particular populations, students are introduced to the field through a laboratory aspect of the course involving the use of tape and video equipment.

SOA 3121, SOA 3122 Fieldwork I, II **4 Q.H. each**

Data collection through participant observation and related anthropological methods. Data analysis and reports. (Not offered in years in which SOC 3120 and SOC 3121 are offered.)

SOA 3135 Language and Communication

Human communication, including language. Theories of the evolution of language and the application of models derived from the study of language to other aspects of behavior.

SOA 3145 Peasants

Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to postpeasant and industrialized societies.

SOA 3155 Individual and Culture

Examination of current theory and method in the study of the interplay between personality and culture. Contributions by various disciplines are discussed.

SOA 3156 Family in Evolutionary Perspective **4 Q.H.**

The emergence of family from prehuman patterns, its biological and behavioral components, and its cross-cultural variations examined from an evolutionary perspective.

SOA 3185 Aggression

Concepts of aggression as they have been used in evolutionary and comparative anthropological formulations. Professional and popular publications in anthropology, ethology, and psychology are analyzed.

SOA 3220 Culture and Mental Illness

Discussions and analyses of the nature and meaning of culture, the role of culture in personality formation, culture and anxiety, anthropological approaches to the normal and the "abnormal," and the question, "Is mental illness psychological fact or cultural fiction?"

SOA 3265 Anthropology of Religion

Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and movements in relation to social, religious, and political organization.

SOA 3275 The Anthropology of Music

The examination of music in a prehistoric and cross-cultural perspective, with emphasis on ethnomusicology and the comparison of Western and non-Western musical culture. Functions and social contexts of musical composition and performance; the ethnography of musical performance groups, the analysis of music as a form of communication.

SOA 3300 Cultural Ecology

Examines human adaptation to environment and the effect of different human adaptations on natural systems.

SOA 3310 Social Change and Economic Development

Selected studies of processes of transformation and modernization in nonindustrial societies.

SOA 3345 Urban Ethnography

Selected problems in anthropological studies in urban societies.

SOA 3355 The Anthropology of Law and Conflict

Settling disputes in stateless societies; forms and mechanisms of social control; law as an indicator of cultural and social norms; the study of conflict resolution as an ethnographic tool. Some field research and analysis is required.

SOA 3360 Economic Anthropology

Types of economic systems in simple societies: reciprocal, redistributive, market exchange; economic relations as part of social relations; land-tenure systems, credit systems, savings mechanisms. The transition from subsistence to cash economics.

SOA 3410, SOA 3411, SOA 3412, 3 Q.H. each SOA 3413 Contemporary Issues in Social Anthropology

Contemporary issues in the field of anthropology. Supervised readings and written reports on special programs.

SOA 3420 Kinship and Social Structure

A variety of kinship systems and their terminological and structural components and the way in which their systems articulate with other social institutions.

SOA 3425 Tribal Societies and Culture

The structures and institutions of bands, tribes, and chiefdoms: comparative and functional studies of tribal societies and the dynamics of change under contact situations.

SOA 3440, SOA 3441, SOA 3442, 3 Q.H. each SOA 3443, SOA 3444, SOA 3445

Ethnographic area courses (New World Indian, African, Indian, Chinese, and others) are offered as resources permit.

SOA 3600, SOA 3601, SOA 3602 3 Q.H. each Seminar

Discussion of selected topics in the field of anthropology.

SOA 3798 Master's Thesis Continuation 0 Q.H.

SOA 3800, SOA 3801, SOA 3802 Directed Study in Social Anthropology Maximum: 9 Q.H.

Reading and empirical research in social and cultural anthropology supervised by members of the anthropological staff.

SOA 3810 Master's Paper in Social Anthropology 6 Q.H.

Empirical or library research meeting the criteria for publication in a professional journal. *Supervision by members of the department.*

Sociology

Many undergraduate courses in the SOC 300 and 400 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

SOC 3100 Foundations of Social Theory I 4 Q.H.

The classic theorists (Durkheim, Weber, Marx, Simmel, and others) are considered intensively.

SOC 3101 Foundations of Social Theory II 4 Q.H.

An intensive analysis of modern theorists from the 1930s onward (Parsons, Merton, Levi-Strauss, Goffman, Homans, Schutz, Garfinkel, Ricoeur, Lukacs, Habermas, and others). The social and historical context of theory construction is stressed.

SOC 3103 American Society

Study of the development of, and the changes in, the institutional structure of American society in comparison with certain other social systems.

SOC 3113 Introduction to Research Methods 2 Q.H.

An introduction to methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and uses of available data. *Open only to law, policy and society students.*

SOC 3114 Introduction to Quantitative Research Methods 2 Q.H.

An introduction to quantitative techniques of analysis. Students are expected to conduct individual research projects. *Open only to law, policy and society students. Prereq.: SOC 3113 or equivalent.*

SOC 3115 Statistical Methods for Sociologists 4 Q.H.

Detailed introduction to statistical methods relevant to sociology. Topics include tabular analysis, non-parametric statistics, analysis of variance, regression analysis, path analysis, measures of association, estimation and univariate and multivariate hypothesis testing. A knowledge of elementary statistical theory is presumed.

SOC 3116 Introduction to Research Methods 4 Q.H.

A survey of methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and use of available data.

SOC 3117 Quantitative Research Methods

Quantitative techniques of analysis. Students are expected to conduct individual research projects. *Prep.: SOC 3116 (or equivalent) or consent of the instructor.*

SOC 3120, SOC 3121 Seminar in Qualitative Analysis I, II 4 Q.H. each

Qualitative techniques of analysis. Social-structure process and meaning in interacting groups. Each student is expected to study a face-to-face group by means of participant observation using symbolic interaction concepts. *(Not offered in years in which SOA 3121 and SOA 3122 are offered.)*

SOC 3125, SOC 3126, SOC 3127 1 Q.H. each Proseminar

This course is suggested for entering students. The focus is on issues related to graduate student life and expectations, professional and career choices, and works in progress. Students have an opportunity to explore more informally, with each other and with various faculty members, some of the important issues in the profession.

SOC 3135 Issues in Social Psychology

Human behavior and theories of self from a sociological and psychological perspective. Special consideration of interpersonal relations, socialization, and symbolic interaction.

SOC 3140 Sociology of Prejudice and Discrimination

A study of the characteristics, causes, and consequences of prejudice and discrimination, with particular reference to American society.

SOC 3147 Urban Sociology

Theories of the development of urban life. Comparisons between preindustrial and industrialized urban areas. Methods for the study of urban social structure and change. Evaluation of contemporary metropolitan action programs.

SOC 3148 Boston Seminar

A case study in urban development, including the evaluation of environmental and historical circumstances, demands for services, response to events, programs. Basis for value systems of Yankees, ethnics, and cosmopolitans. Impact on downtown and neighborhood relations. Metropolitan prospects.

SOC 3149 Metropolitan and Regional Issues

Comparative analyses of problems, policies, programs, and activities associated with metropolitan and regional life. Includes assessment of values, institutions, networks, interest groups, decision making, service delivery, growth and development, environment, equity, and integration. Case studies in societal context.

SOC 3155 The Family

Social structure and social functions of the family as a social institution. Relations between the family and other institutions in society are examined comparatively and historically.

SOC 3160 Women, Men, and Social Change

The Industrial Revolution and the corresponding changes in the labor force and patterns of domestic life have altered the sexual division of labor. In post-industrial society new institutional forms are recasting personal relations. The course examines these forces of social change and their impact on sex roles.

SOC 3165 Sociology of Education

The structure and functioning of educational institutions. Student, faculty, and administrative perspectives. Emphasis is placed on the role of education in processes of socialization, social mobility, social change, and social control.

SOC 3166 Sociology and Anthropology in the Schools

(Listed as ED 3322 in the Boston-Bouvé Graduate School catalog) The course offers a setting in which current and prospective teachers of sociology and anthropology at the precollege and community college levels have the opportunity to analyze curricula in their fields and consider alternative rationales for various approaches to teaching sociology and an-

thropology at these levels. Study also focuses on the potential uses of sociological and anthropological concepts in analyzing and solving educational problems. Students are expected to present either a course or unit they have prepared or a project they have planned or conducted utilizing a sociological or anthropological perspective.

SOC 3170 Intergroup Relations

The relations between various racial, national, cultural, and religious groups with emphasis on historical development. Particular attention is paid to American society with its specific problems of adjustment and assimilation.

SOC 3171 Race and Ethnic Relations:

A World Perspective

Cross-cultural analysis of race and ethnic relations in Western and non-Western societies. Explanations of race and ethnic relations in terms of contemporary developments, world problems, and ideological conflicts.

SOC 3175 Sociology of Work

The course is designed to examine the effects which the social organization of work has on the lives of workers as well as on the structure of society.

SOC 3176 Sociology of Occupations and Professions

The relations between the occupations and professions and society. Special topics may include occupational stratification, professional group behavior, recruitment and socialization of occupations and professions, and political activism.

SOC 3185 Sociology of Deviant Behavior

Applications of sociological concepts and principles to some problems of social disorganization in industrial societies. Analysis of such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling.

SOC 3186, SOC 3187 Social Control I, II

Seminar in research, theories, and methods in the sociology of social control.

SOC 3190 Sociology of Delinquency

Social and social psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment.

SOC 3200 Sociology of Alcoholism

The course examines four general problem areas: the conditions under which people categorize others as alcoholics; the processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images as alcoholics; the development of drinking careers and their relationship to deviant subcultures; and the social situations in which people transform their deviant identities as alcoholics. The course applies organizational analysis to the development and changing network of alcoholism treatment services and tries to develop some tentative generalizations on the social organization of alcoholism.

SOC 3205 Sociology of Crime and Justice

A sociological and legal analysis of the criminal justice system, concentrating on police and law enforcement; plea-bargaining; courtroom research and trial strategies; sentencing; and prisoners' rights and corrections. The relationship between race, social class, and crime is also considered, as are the sociological explanations of crime causation.

SOC 3206 Sociology of Law

Fundamentals of law. The concept of social control. Order and law. Consensus and conflict. Analysis of the normative-formative influences of law. Mores and morals. The concept of justice. Analysis of some legal institutions.

SOC 3215 Sociology of Medicine

Social aspects of illness and medicine, historically and cross-culturally. Illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Research studies in the field are examined critically and problems for future research specified.

SOC 3225 Sociology of Aging

A critical examination of the field of social gerontology, the nature and roots of ageism and topics such as elderly housing, life study, institutionalization, health care, retirement, leisure, and senior power.

SOC 3226 Processes of Aging

Socioeconomic and social psychological consequences of aging are examined from the perspective of health-care providers. A major part of the course focuses directly on the biological changes entailed in aging and the appropriate medical management of geriatric patients. Open to students expected to provide health-care services to geriatric patients.

SOC 3240 Formal Organizations:

Administration and Structure

Analysis of the goals and functions of modern organizations. Aspects of bureaucratization are examined within business firms, public institutions, and private associations.

SOC 3245 Sociology of Poverty

An analysis of sociological perspectives on causes of poverty, public views on poverty, and institutional responses to poverty. A concern with policy issues and implementation of policies is emphasized. For advanced students in the social sciences and in the various human service schools in the University.

SOC 3275 Sociology of Art

1 Q.H.

Examination of the practices which lead to the production of artistic meaning; the relationship of art to society; the nature of artistic communities, their relationship to patronage systems and art markets; the manner in which these systems are rooted in particular social and historical contexts.

SOC 3276 Popular Culture

Both pluralist and mass culture theories are inadequate in explaining mass popular culture; therefore,

a primary objective of the course is to develop and refine an efficient theoretical framework. Problems to be addressed include the relationship between popular culture, high culture, and folk culture and the genesis and role of the mass media in industrial societies. The course also focuses on empirical research in several forms of popular culture, including sports, rock music, and science fiction novels. Organization and impact of market, stylistic shifts, and the viability of criticism are examined.

SOC 3286 The Sociology of Science

Selected topics dealing with interactions between science and society.

SOC 3300 Contemporary Sociological Theories

Analytic treatment of major contemporary theories such as functionalism, conflict, neo-Marxism, and others. *Prep.: SOC 3100 and SOC 3101 (or equivalent) or consent of the instructor.*

SOC 3301 Recent Developments in Sociological Theory

This course is required for students in the Ph.D. program who seek a comprehensive treatment of current developments in sociological theory. Among the schools which might be considered are: critical theory, modern Marxist theory, contemporary French theory, semiotics, hermeneutics, symbolic interactionist theory, and other emerging schools of thought. The specific content of the course changes periodically in order to keep the focus of the course on new horizons in theory. The relation of theory to research is also a main goal of the course. Topics will be selected and announced by the instructor in advance. *Prep.: SOC 3100 and SOC 3101 (or equivalent) or consent of the instructor.*

SOC 3302 Sociology of Knowledge

The relationship between the social base of a society and its intellectual products. The viewpoints of authors such as Marx, Weber, Mannheim, G.H. Mead, the Neo-Marxians, and other modern schools are considered. *Prep.: SOC 3100 and SOC 3101 (or equivalent), or consent of the instructor.*

SOC 3303 Economic Sociology

The role of economic factors in the social process. Consideration is given to both classic economic theory and its impact on classic social theory, and the potential interrelations between modern economic theory (especially model-building approaches) and general sociological problems.

SOC 3304 Feminist Theory

Considers major trends in feminist theory since the rise of the contemporary women's movement. It begins with early theories, identified as Marxist-Feminist, Socialist-Feminist, and Radical-Feminist, and then considers important feminist issues: the origins and universality of women's oppression, the reproduction of gender in the family (neo-Freudian feminist and anthropological approaches), women's work under capitalism, and sexuality.

SOC 3310, SOA 3311 Social and Cultural Change S,A

Two-quarter course in conjunction with Anthropology. Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

SOC 3320 Multiple Regression in Sociological Analysis

This course focuses on techniques of sociological analysis based on multiple regression, e.g., use of coded variables, trend analysis, covariance analysis, model testing. *Prep.: SOC 3117 and SOC 3115 (or equivalents).*

SOC 3321 Current Issues in Social Research

Selected topics in methods of social research are examined. *Prep.: SOC 3116 and SOC 3117 (or equivalent) or consent of the instructor.*

SOC 3322, SOC 3323 Experimental Methods in Social Research I, II

Experimental design and laboratory methods in sociology. The small groups laboratory is treated as a setting for testing sociological theory. The emphasis is upon techniques and problems in the creation and manipulation of social variables in the laboratory situation, although the techniques of the natural experiment are also considered.

SOC 3325 Sociology of Policy, Planning, and Evaluation

A general introduction to the social, political, and economic factors affecting policy formation and the eventual success or failure of social programs in health, education, welfare, and urban planning. Stress on evaluation of policy alternatives and planning problems. For advanced students in the social sciences and in the various human service schools of the University.

SOC 3335 Seminar in Symbolic Interaction

The social psychology of groups as found in the works of Mead, Becker, Blumer, Goffman, and others.

SOC 3336, SOC 3337, SOC 3338 Seminar on Socialization I, II, III

I) Instructor reviews theories and findings in organizational socialization. II) Students are expected to design studies in organizational socialization. III) Students are required to present results of their studies. *Not open to first year students.*

SOC 3345 Community Analysis

Ecological theories of human relations with the physical environment. Development of the concept of, and discussion of methods for, community study. Comparison between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

SOC 3347 Seminar in Urban Social Policies 4 Q.H.

Social science theories and methods evaluated from the perspectives of urban affairs. *Consent of instructor.*

SOC 3355 Political Sociology

Sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

SOC 3357 Comparative Socialism

Analysis of twentieth century socialism from a comparative perspective. The variety of "socialisms" that have developed in the Soviet bloc, China, Yugoslavia, and Cuba, as well as Western social democracy (Sweden) and Eurocommunism. Topics include political structure, class relations, industrial organization, cultural formations, dynamics of change, and democratization.

SOC 3360 Social Stratification

Theories of inequality between groups in historical perspective, from classical to modern industrial times. Discussion and evaluation of sociological research in social stratification with regard to different social and cultural groups.

SOC 3365 Social Movements

A study of various movements for social change from all points of the political spectrum. Special attention will be given to the structural context, as well as to such processes of social movements as social base, leadership, strategy, and organization.

SOC 3390, SOC 3391 Seminar in Social Structure I, II

Seminar relating current theories and research in sociology, social psychology, and social anthropology.

SOC 3405 Theories of Criminology

Theories and philosophies underlying various correctional systems. Schools of thought in criminology and penology. Theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

SOC 3410, SOC 3411, SOC 3412, 3 Q.H. each SOC 3413 Contemporary Issues in Sociology

Contemporary issues in sociology. Supervised readings and written reports on special problems.

SOC 3430 Latin American Societies

Study and analysis of selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasis on urbanization and industrialization, social and political change.

SOC 3431 Middle East Area Study

Sociocultural analysis of the Middle East. Ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Comparative regional analysis.

SOC 3470 Sociology of Religion

A sociological analysis of religious institutions and experiences in their historical and contemporary content. Religion context and political context are considered.

SOC 3485 Computers and Society

Graduate seminar on the social impact of the computer "revolution" on the contemporary world. Topics include conditions of work, education, recreation, privacy, the computer science profession, paradigms of human thought, politics, and social change in the world economy.

SOC 3600, SOC 3601, SOC 3602 3 Q.H. each Seminar

Discussion of selected topics in the field of sociology.

SOC 3603 Rhetoric in Sociology

Critical examination of the conventional forms of sociological writings. How conventions differ by theoretical perspective and paradigm.

SOC 3615 Tutorial in Teaching 3 credits max.

Discussion of issues and problems in teaching. This is a required course for all doctoral candidates and should be taken during a quarter when the student has major responsibility for designing and executing a course in either sociology or anthropology. Open to doctoral candidates only.

SOC 3620, SOC 3621, SOC 3622 1 Q.H. each Doctoral Proseminar

This course is required of all doctoral candidates and is designed to help socialize them for participation as professional sociologists and anthropologists.

Topics discussed include the nature of intellectualism and the functions of an intellectual in society today, the university as a structure and as a community of scholars, the nature of professional organizations, teaching sociology and anthropology, the organization of sociological and anthropological research, ethics in the profession, the nature of applied sociological and anthropological work. The course offers participants the opportunity to acquire practical experience in self-presentation and giving colloquia. *Prep.: SOC 3321 and SOC 3300 or SOC 3301 or SOC 3302 or consent of the instructor.*

SOC 3798 Master's Thesis Continuation 0 Q.H.**SOC 3799 Doctoral Dissertation Continuation 0 Q.H.****SOC 3800, SOC 3801, SOC 3802 Max.: 9 Q.H. Directed Study in Sociology**

Reading and research under the direction of a faculty member. *Open to doctoral candidates only.*

SOC 3810 Master's Paper in Sociology 6 Q.H.

Empirical or library research meeting the criteria for publication in a professional journal. *Supervision by members of the department.*

SOC 3820 Doctoral Dissertation (No credit)

Biology

BIO 3509 Principles of Systematics 2 Q.H.

Presentation of theories and techniques employed in systematics; rules according to the International Codes of Zoological and Botanical Nomenclature.

BIO 3510 Environmental and Population Biology 2 Q.H.

Physiochemical factors influencing and influenced by organisms. Interaction among individual organisms and among species. Students are expected to participate in lectures and laboratories given for BIO 1211. Individual work on specialized aspects of ecology is assigned. *Prereq.: One year of general biology, including plant and animal biology. Open only to graduate students completing deficiencies in entrance requirements.*

BIO 3511 Aquatic Ecology 3 Q.H.

Chemical, physical, and biotic features influencing coastal, lake, and stream communities. Lectures. *Prereq.: BIO 1211 or BIO 3510 or equivalent.*

BIO 3512 River Ecology Laboratory 3 Q.H.

Two four-hour sessions per week (combined lecture and lab). Chemical determinations, measurement of primary and secondary production, organismal identification in flowing waters of different types.

BIO 3517 Lake Ecology Laboratory 3 Q.H.

Two four-hour sessions per week (combined lecture

and lab). Chemical determinations, measurement of primary and secondary production, organismal identification in lakes of different types.

BIO 3518 Ecology of Salt Marshes 3 Q.H.

Survey of fauna and flora, environmental factors affecting them, and current biological and social problems associated with salt marshes. This course will meet for two lectures of one and one-half hours each, and one full day of laboratory for six weeks during the summer quarter. *Prereq.: BIO 1211 or BIO 3511 or equivalent.*

BIO 3519 Ecology of Rocky Shores 4 Q.H.

Examination of current ecological concepts regarding rocky intertidal and subtidal communities. The influence of biotic and abiotic factors on composition, distribution, and diversity of plant and animal species is emphasized.

BIO 3520 Environmental Microbiology 4 Q.H.

The microbial environment and ecology of the cell. Interactions between microbial populations, stressing soil and fresh-water associations. *Prereq.: BIO 1320 or equivalent.*

BIO 3521 Food Microbiology 3 Q.H.

Microbiology of food with emphasis on pathogenic types and their interactions with other groups indigenous to food. Food fermentations, food processing,

and environmental factors influencing growth and development of microorganisms in food. *Prereq.: BIO 1320 or equivalent.*

BIO 3522 Food Microbiology Laboratory 2 Q.H.
Detection, quantification, and isolation of microorganisms and their products of significance in food with emphasis on the pathogenic types. *Prereq.: BIO 3521 (may be taken concurrently).*

BIO 3527 Animal Virology 3 Q.H.
Physical and chemical properties of viruses, viral replication, genetics, cytopathology, and tumor viruses. Medical virology, including pathogenesis, clinical features, epidemiology, and immunization of the common viral diseases. *Prereq.: BIO 1320 or equivalent.*

BIO 3528 Animal Virology Laboratory 2 Q.H.
Cultivation and identification of viruses. Use of animals, eggs, and animal cell cultures for viral assays. *Prereq.: BIO 3527 (may be taken concurrently).*

BIO 3531 Plant Growth and Reproduction 4 Q.H.
Plant hormones, growth, development, and physiology of reproduction.

BIO 3547 Biomechanics I, Theory 4 Q.H.
An introduction to engineering theory and techniques as applied to the disciplines of morphology, evolution, and ecology. Topics include material properties, structural elements and systems, and elementary fluid dynamics. Laboratory emphasizes biological materials in a mechanical sense, the physical biology of flow, and an examination of the fundamental principles of physical laws that affect living organisms. *Prereq.: Permission of instructor.*

BIO 3548 Biomechanics II, Applications 4 Q.H.
A forum for research in biomechanics in which students are expected to develop and execute a research project. In addition, current areas of biomechanical research will be reviewed and evaluated. *Prereq.: BIO 3547 and permission of instructor.*

BIO 3549 Physiology and Biomechanics of Animal Activity 3 Q.H.
An integrated study of the physiological and biomechanical systems that support locomotory activity in animals. The first part is devoted to the structure and function of skeletal muscle and to respiratory and cardiovascular adaptations for activity. The remainder integrates physiological and biomechanical information related to flying, swimming, and terrestrial locomotion. *Prereq.: General physiology.*

BIO 3550 Cardiovascular Physiology 3 Q.H.
Physiology of blood cells, anemia, polycythemia immunity, and allergy. Electrophysiology of the heart, cardiac cycle, EKG, hemodynamics, capillary dynamics, pulmonary circulation, cardiovascular reflexes, cardiac output, and venous return. Cardiac failure, coronary circulation, atherosclerosis, hypertension, cerebral circulation, circulatory shock.

BIO 3551 Cardiovascular Physiology Laboratory 1 Q.H.
Three hours of laboratory study per week. *Prereq.: BIO 3550.*

BIO 3552 Osmotic and Ionic Regulation 2 Q.H.
Comparative physiology of regulation and transport of water and the principle solutes in animals. Principles and underlying mechanisms will be discussed, as well as examples selected from a variety of phyla. *Prereq.: Basic physiology.*

BIO 3553 General Physiology of Invertebrates 4 Q.H.
Basic animal functions as manifested among the major groups of invertebrates, with comparisons to the vertebrates, especially aquatic vertebrates. The course considers the cellular and biochemical bases for the functions, their control, their adaptiveness to diverse environments, and their evolutionary implications. Topics usually include: respiration, circulation, nutrition, metabolism, excretion, salt and water balance, temperature responses, biological clocks, sensory organs, and various effector organs.

BIO 3554 Comparative Vertebrate Physiology 4 Q.H.
This course considers physiological principles in the context of the phylogenetic diversity of the vertebrates, histories and environments. Comparisons with invertebrate systems will be made when appropriate. Major themes to be considered include: energetics, temperature regulation, skeletal muscle, and salt and water balance. Laboratory. *Prereq.: BIO 1261 or equivalent.*

BIO 3558 Vertebrate Endocrinology 3 Q.H.
Principles of hormonal regulation of physiological processes in vertebrates, mechanisms of hormone action, neuroendocrine relationships.

BIO 3559 Animal Nutrition 2 Q.H.
Detailed consideration of organic and inorganic nutritional requirements of humans and selected animals. Digestion, absorption, and metabolism of nutrient materials. Role of vitamins, minerals, and trace elements in metabolism. Variation in nutritional needs among normal individuals and in various physiological and genetic pathologies. Evaluation of food additives and of permissible levels of toxic materials in food. *Prereq.: Basic biochemistry or consent of instructor.*

BIO 3560 Genetics and Developmental Biology 2 Q.H.
Elaboration of the classic laws of heredity, including cytogenetics and chemical basis of heredity. Selected examples of the development of form and function. Students are expected to participate in lectures and laboratories given for BIO 1260 and are assigned extra individual work. *Prereq.: General biology. Open only to graduate students completing deficiencies in entrance requirements.*

BIO 3561 Cell Physiology and **2 Q.H.****Biochemistry**

Basic chemical and physical processes of cells related to their fine structure; oxidative and intermediary metabolism, photosynthesis, membrane phenomena; movement; chemical and physical processes of prokaryotic and eukaryotic cells. Students are expected to participate in lectures and laboratories given for BIO 1261. Extra, individual work is assigned. *Prereq.: General biology, college physics, and organic chemistry. Only open to graduate students completing deficiencies in entrance requirements.*

BIO 3562 General Biochemistry **3 Q.H.**

A survey of the field of biochemistry with emphasis on protein structure, enzyme catalysis, bioenergetics, chemistry and metabolism of carbohydrates, lipids, amino acids, and nucleotides, and the synthesis and function of macromolecules in the context of organelle development. *Prereq.: Permission of instructor. Required of all entering graduate students in biochemistry, cell physiology, and molecular biology. Students may be exempted by successfully completing the final examination from a previous year's course.*

BIO 3563 General Biochemistry Lab **4 Q.H.**

An intensive course intended to introduce the student to modern research technique used in biochemistry and molecular biology. Topics include purification and characterization of proteins, kinetic properties of enzymes, isolation of high molecular weight DNA, recombination of DNA molecules in vitro, isolation of bacterial clones containing recombinant molecules, and in vitro mutagenesis. The course includes two hours of lecture and seven hours of laboratory. Lectures will include a discussion of safety and moral concerns raised by uses of genetic engineering. Required of all entering graduate students in biochemistry, cell physiology, and molecular biology.

BIO 3567 General Biochemistry **3 Q.H.**
Laboratory

An intensive course intended to introduce the student to modern research technique used in biochemistry and molecular biology. Topics include purification and characterization of proteins, kinetic properties of enzymes, isolation of high molecular weight DNA, recombination of DNA molecules in vitro, isolation of bacterial clones containing recombinant molecules, and in vitro mutagenesis. The course includes two hours of lecture and six hours of laboratory. Lectures will include a discussion of safety and moral concerns raised by uses of genetic engineering. Required of all entering graduate students in biochemistry, cell physiology, and molecular biology. *Prereq.: Consent of the instructor.*

BIO 3569 Microbial Genetics **3 Q.H.**

Principles and practical application of the genetics of microorganisms. Genetic exchange in bacteria mediated by bacteriophage and plasmids is emphasized. Several eukaryotic systems are also discussed. *Prereq.: BIO 1320 or equivalent.*

BIO 3572 Biology of Meiofauna **2 Q.H.**

Systematics and ecology of marine interstitial fauna. *Prereq.: Invertebrate zoology.*

BIO 3577 Malacology **4 Q.H.**

Functional morphology, embryology, systematics, and ecology of the major groups of molluscs. *Prereq.: Invertebrate zoology.*

BIO 3601 Biological Electron Microscopy **4 Q.H.**

Techniques of electron microscopy applied to biological materials. Specimen preparation, fixation, thin-sectioning, staining, operation of electron microscope, photographic techniques, interpretation of electron micrographs. Student seminars and project required. *Prereq.: Consent of the instructor.*

BIO 3607 Advanced Developmental Biology **3 Q.H.**

Study of current concepts of animal and plant development at the molecular and physiological levels. Among topics of discussion are nucleic acid and protein synthesis in development, metabolic activation at fertilization, regulation of the eukaryotic genome, control of cell differentiation, and molecular communication between cells. Reading and interpretation of the primary literature is stressed. Three hours of lecture per week.

BIO 3608 Advanced Developmental **2 Q.H.**
Biology Laboratory

Analysis of the fundamental problems of development through experimental techniques. Culture of vertebrate and invertebrate embryos, microsurgical analysis of morphogenesis, biochemistry of development, cell-cell interactions, and organ and tissue culture are studied. Five hours of laboratory per week. *Prereq.: BIO 3607 or consent of the instructor.*

BIO 3609 Cellular Aspects of Development **3 Q.H.**

Study of animal and plant development at the cellular level. Among discussion topics are cell-cell interaction, cell surface differentiation, differential cell adhesion, genetic and epigenetic control or pattern formation, and ultrastructural aspects of fertilization and development. Reading and interpretation of the primary literature are stressed. Three hours of lecture per week.

BIO 3610 Human Ecology **4 Q.H.**

Human tolerances for natural and unnatural environmental factors and man's activities affecting these factors. Man, food, and population dynamics.

BIO 3617 Environmental Law **2 Q.H.**

The scientific information required for implementation of the legal and political aspects of environmental management. The role of the scientist as an expert witness. Scientific and legal predictability. Analyses of suitable dynamic models and case law with the goal of improving the results of legal, political, and scientific decisions bearing upon remedial environmental management. *Prereq.: Biology core and first course in physiology, e.g., BIO 1258 and BIO 1259.*

BIO 3620 Industrial Microbiology 3 Q.H.

Microorganisms and methods employed in production of products of economic and medical importance, decomposition of wastes, and control of desirable and unwanted processes and biodeterioration. Fermentation processes emphasized. *Prereq.: BIO 1420 or equivalent, or consent of instructor.*

BIO 3621 Industrial Microbiology Laboratory 2 Q.H.

Laboratory and discussion seminar sessions devoted to the study of selected commercial processes.

BIO 3652 Comparative Neurobiology 3 Q.H.

A cellular approach to structure and function of the nervous system. Topics to be covered include neuronal anatomy, cellular properties of single neurons, synaptic transmission, integration in nerve cells, nerve networks, sensory systems, motor systems, sensory-motor integration, specification of neuronal connectivity, and phylogeny of nervous systems. *Prereq.: General (animal) physiology.*

BIO 3657 Neurophysiology Laboratory 2 Q.H.

Introduction to neurophysiological methods. *Prereq.: BIO 3652 (may be taken concurrently).*

BIO 3661 Human Genetics 3 Q.H.

Application of basic genetic principles to the study of variability in humans. Course focuses primarily on cytogenetics, biochemical genetics, monogenetic, and multifactorial inheritance and population genetics. Topics of special interest include sex determination and differentiation, early embryology, twinning, birth-defect etiology, prenatal diagnosis, and genetic counseling. *Prereq.: BIO 1260 or equivalent.*

BIO 3662 Immunochemistry 4 Q.H.

This is an intensive course which involves a discussion and application of modern immunochemical topics and laboratory techniques. Among the topics included are the *in vitro* immunization of spleen cells, preparation of monoclonal antibodies, antibody-labelling procedures, enzyme-linked immunoassays (ELISA), immunofluorescence, immunoaffinity chromatography, and immunoelectrophoresis. The course consists of 2 hours of lecture and 6 hours of laboratory per week in 2 sessions of 4 hours each.

BIO 3667 Biochemistry Laboratory Rotation I 3 Q.H.

Experience is gained in biochemical research by spending six weeks in each of two laboratories during the winter quarter. Required of all first-year graduate students in biochemistry, cell physiology, and molecular biology.

BIO 3668 Biochemistry Laboratory Rotation II 3 Q.H.

A continuation of BIO 3667 during the spring quarter.

BIO 3669 Biochemistry Laboratory Rotation III 3 Q.H.

A continuation of BIO 3668 during the summer quarter intended for students who have not yet chosen a laboratory in which to carry out thesis work. Not recommended except where necessary.

BIO 3670 Developmental Biology of Marine Invertebrates 5 Q.H.

Descriptive and experimental studies of embryonic and larval development of marine invertebrates. Laboratory work includes observation and experimentation using live material from a broad spectrum of invertebrate phyla (Marine Science and Maritime Studies Center).

BIO 3671 General Helminthology 3 Q.H.

Morphology, life histories and biology of helminths parasitic in animals.

BIO 3672 Ichthyology 4 Q.H.

Natural history and systematics of fishes, with emphasis on marine species (Marine Science and Maritime Studies Center). *Prereq.: Comparative anatomy or vertebrate zoology.*

BIO 3690 Seminar 1 Q.H.

Various topics and recent developments in botany, biochemistry, microbiology, molecular biology, physiology, and zoology are covered in depth. Student presentations are emphasized. To facilitate the planning of assignments, students are urged to contact the instructor during the quarter before the seminar is to be offered.

BIO 3691 Special Topics in Biology (credit variable)

Special study of a selected topic under direction of a faculty member, preliminary to submission and approval of M.S. thesis proposal or M.S. literature dissertation proposal. Topic and direction of study to be arranged with the faculty member supervising the study. Credits convertible to M.S. thesis or M.S. dissertation.

BIO 3692 Special Investigations in Biology (credit variable)

Studies of a topic not directly related to research being pursued for a thesis or dissertation. May take the form of a special course.

BIO 3697 M.S. Thesis (credit variable)

Research methods of some special field and their application to a specific problem, under direction of a graduate faculty member.

BIO 3698 M.S. Literature Dissertation (credit variable)

An extensive literature research under the direction of a graduate faculty member leading to a comprehensive written review of a significant biological problem and an oral examination.

BIO 3699 Ph.D. Dissertation

Original research in depth, representing a significant contribution of new biological knowledge, and a written dissertation thereon, under the supervision of a graduate faculty member.

BIO 3798 Master's Thesis Continuation 0 Q.H.**BIO 3799 Doctoral Dissertation Continuation 0 Q.H.**

Chemistry

All courses carry two quarter-hours of credit unless otherwise specified.

I. Introductory Courses

CHM 3231 Analytical Chemistry 1 Q.H.

A beginning course in analytical chemistry for those students whose background in the subject is deemed inadequate. *Prereq.: Permission of the departmental faculty is required.*

CHM 3271 Organic Chemistry I 1 Q.H.

A beginning course in organic chemistry for those students whose background in the subject is deemed inadequate. *Prereq.: Permission of the departmental faculty is required.*

CHM 3272 Organic Chemistry II 1 Q.H.

Continuation of CHM 3271. *Prereq.: Permission of the departmental faculty is required.*

CHM 3273 Organic Chemistry III 1 Q.H.

Continuation of CHM 3272. *Prereq.: Permission of the departmental faculty is required.*

CHM 3381 Physical Chemistry I 1 Q.H.

A beginning course in physical chemistry concentrating on chemical thermodynamics for those students whose background in the subject is deemed inadequate. *Prereq.: Permission of the departmental faculty is required.*

CHM 3382 Physical Chemistry II 1 Q.H.

Continuation of CHM 3381 concentrating on phase equilibria, solutions, kinetic theory of gases, chemical kinetics. *Prereq.: Permission of the departmental faculty is required.*

CHM 3383 Physical Chemistry III 1 Q.H.

A beginning course in physical chemistry concentrating on quantum chemistry, particles and waves, Schrodinger wave mechanics for those students whose background in the subject is deemed inadequate. *Prereq.: Permission of the departmental faculty is required.*

CHM 3401, CHM 3402, CHM 3403 Special Topics in Chemistry: Chemistry and Society I, II, III

Special topics of current importance, including chemical aspects of the environment: pollution and its determination, pesticides, carcinogenics, resources; chemical aspects of energy conversion and storage: fossil fuels and fuel analysis; nuclear reactors; storage batteries; hydrogen production and storage; solar energy, photovoltaic cells and photochemistry; energy-related materials. *Prereq.: Bachelor's degree in science or engineering.*

CHM 3420 Modern Methods of Analysis 2 Q.H.

Similar to CHM 3430, but without laboratory. *Prereq.: Consent of instructor.*

CHM 3430 Modern Methods of Analysis 3 Q.H.

Training in a wide variety of modern methods of instrumental analysis with extensive "hands-on" experience offered by a laboratory section. Areas cov-

ered include: data handling; spectroscopy (UV-visible, infrared, luminescence, atomic absorption, atomic emission, mass spectrometry); separations (gas, thin-layer, high performance liquid chromatography); electrochemical methods (LCEC, amperometry, coulometry, polarography, etc.); computerized instrumentation; hyphenated methods of trace organic/inorganic analysis; forensic and clinical applications of modern methods of analysis. *(Restricted to students in the Forensic Chemistry MS and PhD programs, Clinical Chemistry MS and PhD programs, and others by special arrangement.)*

CHM 3431 Instrumental Analysis 1 Q.H.

A beginning course in instrumental analysis for those students whose background in the subject is deemed inadequate. *Prereq.: Permission of the departmental faculty is required.*

CHM 3441 Inorganic Chemistry 1 Q.H.

A beginning course in inorganic chemistry for those thesis students whose background in the subject is deemed inadequate. *Prereq.: Permission of the departmental faculty is required.*

CHM 3461 Identification of Organic Compounds 1 Q.H.

A beginning course in the identification of organic compounds dealing with the qualitative analysis of organic compounds and mixtures, using physical methods for those students whose background in the subject is deemed inadequate. *Prereq.: Permission of the departmental faculty is required.*

CHM 3501 Polymer Chemistry I

Introduction to polymers. Major emphasis on synthesis. Step-reaction, chain-reaction, and ring-opening polymerizations. Copolymerization. Three-dimensional polymers and crosslinking. *Prereq.: One year of organic chemistry and one year of physical chemistry.*

CHM 3502 Polymer Chemistry II

Physical chemistry of polymers in solution and bulk. Molecular characterization. Mechanical and physical properties in the glassy, rubbery, viscous, and semicrystalline states. *Prereq.: CHM 3501.*

CHM 3503 Polymer Chemistry III

Industrial practice, polymer processing, fibers, elastomers, coatings, adhesives, and reinforced plastics. Relationship of polymer structure to usage. *Prereq.: CHM 3502.*

CHM 3510 Special Projects (maximum: 4 Q.H.) in Chemistry

Laboratory studies for non-thesis research. *Prereq.: Permission of the departmental faculty is required.*

II. Required Regular Courses

CHM 3521 Analytical Separations

Theory and practice of analytical separation techniques. Emphasis is on fundamentals as they relate to practice. Topics for examination are based mainly on chromatographic processes including gas and high speed liquid chromatography. Other topics include zone refining, liquid-liquid extraction, and electrophoresis.

CHM 3522 Advanced Analytical Separations.

Continuation of CHM 3521. *Prereq.: CHM 3521.*

CHM 3523 Electroanalytical Chemistry I

The theory, instrumentation and applications of equilibrium and non-equilibrium techniques. A selection will be made from among the following topics: potentiometry, potentiometric titrations, voltammetry, coulometry, chronopotentiometry and conductance measurements.

CHM 3524 Electroanalytical Chemistry II

A continuation of CHM 3523 emphasizing recent advances in electroanalytical instrumentation and application. Topics to be covered include ion-selective electrodes, processes at electrode surfaces, and novel voltammetric techniques. *Prereq.: CHM 3523.*

CHM 3525 Optical Methods of Analysis I

Theory and principles of molecular absorption and emission processes, instrumentation for optical methods of analysis, specific applications and approaches for use of optical methods. Specific topics include: ultraviolet-visible, fluorescence/phosphorescence, infrared, Raman, refractometry, interferometry, polarimetry, circular dichroism, optical rotatory dispersion, light scattering for polymer analysis, optical absorption/emission detectors for HPLC, chemiluminescence, micellar enhancement in spectroscopy, and other special topics of recent development and application.

CHM 3526 Optical Methods of Analysis II

Principles and applications of atomic spectroscopy. A selection will be made from among the following topics: atomic emission, atomic absorption, atomic fluorescence, x-ray absorption, fluorescence and diffraction, and electron spectroscopy. *Prereq.: CHM 3525.*

CHM 3527 Analytical and Organic Mass Spectrometry

Theory and practice of mass spectrometry in chemical analysis. Principles of formation of mass spectra of organic compounds. Modern ancillary techniques using mass spectrometric detectors. *Prereq.: One year of organic chemistry and instrumental analysis.*

CHM 3529 Chemical Instrumentation I: Measurements and Control

A lecture laboratory course illustrating the design of electronic instruments used for chemical measurements. Topics include circuit analysis, transducer characteristics, circuits using basic semiconductor

devices, integrated circuits, signal amplification and signal processing. Interfacing and interrelation of circuits is emphasized.

CHM 3530 Chemical Instrumentation II: Computer Interfacing

A lecture laboratory course illustrating the interface to chemical instruments. Topics include digital logic, computer architecture, data processing, A/D and D/A conversions, and parallel and serial input/output. Standard interfaces such as the 20 ma current loop, RS-232C and the IEEE-488 GPIB are covered in detail. *Prereq.: CHM 3529.*

CHM 3531, CHM 3532 Topics in Analytical Chemistry I, II

Selected topics of current importance in analytical chemistry. *Prereq.: Consent of instructor.*

CHM 3541 Advanced Inorganic Chemistry I

Application of basic quantum chemistry to inorganic systems. Russell-Saunders and j-j coupling. Stereochemistry of non-transition-metal compounds, bonding and structure of electron-deficient systems.

CHM 3542 Advanced Inorganic Chemistry II

Magnetic properties; electronic spectra and selection rules. Thermodynamic stability of coordination compounds. Experimental techniques of inorganic chemistry. *Prereq.: CHM 3541.*

CHM 3543 Advanced Inorganic Chemistry III

Crystal symmetry. Introduction to theory of ligands; semi-conductors and metals; non-stoichiometric compounds; solid-state reactions. Application of molecular orbital theory. Determination of electron distribution in transition metal compounds. Mossbauer spectroscopy and advanced magneto-chemistry. *Prereq.: CHM 3542 and CHM 3591.*

CHM 3561, CHM 3562 Advanced Organic Chemistry I, II

An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prereq.: One year of organic chemistry.*

CHM 3563 Physical Organic Chemistry

Topics in basic physical organic chemistry: molecular polarity, equilibrium and kinetics, reactivity and structure, solvent effects, acid-base catalysis, orbital symmetry, aromaticity. *Prereq.: CHM 3562 or consent of instructor.*

CHM 3564 Spectrometric Identification of Organic Compounds

Interpretation of the ultraviolet, infrared, and nuclear magnetic resonance spectra of organic compounds. *Prereq.: One year of organic chemistry.*

CHM 3581 Chemical Thermodynamics I

First Law of Thermodynamics, Thermochemistry Second and Third Laws, free energies, reaction end phase equilibria. *Prereq.: Consent of instructor.*

CHM 3582 Chemical Thermodynamics II

Partial molar properties, solutions, electrolytes.

Statistical analogues of entropy and free energy, partition functions. *Prereq.: CHM 3581.*

CHM 3583 Chemical Thermodynamics III

Statistical thermodynamics applied to gases, liquids, and solids. Irreversible thermodynamics. *Prereq.: CHM 3582 and CHM 3592.*

CHM 3591 Introductory Quantum Chemistry I

Introduction to quantum mechanics. Application to simple systems. Perturbation theory and applications. Harmonic oscillator, rigid rotor and applications to microwave and infrared spectroscopy. Simple atoms. *Prereq.: One year of physical chemistry.*

CHM 3592 Introductory Quantum Chemistry II

The variational method. The chemical bond. The LCAO method. Group theory and applications. Molecules. Woodward-Hoffman rules. *Prereq.: CHM 3591.*

CHM 3593 Introductory Quantum Chemistry III

Application of group theory and simple approximate theories to conjugated molecules. The SCF method and its application to atoms and molecules. Applications to molecular spectroscopy. *Prereq.: CHM 3592.*

CHM 3594 Chemical Kinetics

Use of experimental data to deduce the rate law of a reaction. Mechanisms deduced from rate laws. Influence of experimental error on precision of rate constants and activation energies. Collision- and transition-state theories of reaction rates. *Prereq.: One year of physical chemistry.*

III. Advanced Courses

CHM 3641 Coordination Chemistry

Solution phase properties of coordination compounds. Experimental methods for the study of thermodynamics stability and kinetic lability. Kinetics and mechanism of solvent exchange and substitution reactions at transition metal centers. Classification of redox reaction mechanisms. Marcus theory. Phenomenological mechanisms. *Prereq.: CHM 3543.*

CHM 3642, CHM 3643, CHM 3644, CHM 3645 Special Topics in Inorganic Chemistry I, II, III, IV

Advanced topics of importance in inorganic chemistry including advanced ligand field theory: crystal field theory of ions in weak and strong fields. Molecular orbital theory of transition metal complexes. Crystal structure determination in solids: crystallography, X-ray, electron and neutron diffraction techniques applied to inorganic, bio-inorganic and other solids. Resonance spectroscopy in inorganic chemistry, including electron spin, nuclear magnetic, and nuclear quadrupole resonance; and Mossbauer spectroscopy. Solid-state chemistry: thermal, magnetic and transport properties; phase transformations and crystal defects; surface effects, material preparation techniques. *Prereq.: CHM 3542 and consent of instructor.*

CHM 3661, CHM 3662 Organic Stereochemistry and Reaction Mechanisms I, II

Interrelations of the stereochemistry of organic molecules with their physical and chemical behavior.

Conformational analysis. The effects of spatial relationships on transition states, equilibria, and reaction rates as an introduction to the study of organic reaction mechanisms. *Prereq.: CHM 3563.*

CHM 3663, CHM 3664 Organic Reaction Mechanisms and Organic Synthesis I, II

The fundamental factors influencing the courses of organic reactions. Substitution reactions. Pericyclic reactions. Synthetic methods as an introduction to organic synthesis. *Prereq.: CHM 3662 or concurrent registration therein.*

CHM 3671, CHM 3672, CHM 3673 Special Topics in Organic Chemistry I, II, III

Selected topics of current importance in organic chemistry. *Prereq.: CHM 3562 and consent of instructor.*

CHM 3681, CHM 3682, CHM 3683 Special Topics in Physical Chemistry I, II, III

Advanced topics of importance in physical chemistry including quantum chemistry: linear algebra and the formulation of quantum theory. Angular momentum. Group theory. Small molecules. Time-dependent theory and selected advanced topics. Statistical mechanics. Quantum statistics; electrons in metals, photons, and phonons; superconductivity; fluctuations, noise, and irreversible thermodynamics; transport phenomena; phase transitions of high order. *Prereq.: Consent of instructor.*

CHM 3800 Analytical Seminar

1 Q.H.

Oral reports by the participants on current investigations in analytical chemistry. *Prereq.: Enrollment in full-time program.*

CHM 3801 Inorganic Seminar

1 Q.H.

Oral reports by the participants on current investigations in inorganic chemistry. *Prereq.: Enrollment in full-time program.*

CHM 3802 Organic Seminar

1 Q.H.

Oral reports by the participants on current investigations in organic chemistry. *Prereq.: Enrollment in full-time program.*

CHM 3803 Physical Chemistry

1 Q.H.

Oral reports by the participants on current investigations in physical chemistry. *Prereq.: Enrollment in full-time program.*

CHM 3810 Research for M.S. (Maximum: 14 Q.H.)

Original research, under supervision of a faculty member, leading to a written thesis thereon or to the establishment of doctoral candidacy.

CHM 3820 Research and Dissertation for Ph.D.

Original research in depth, representing a significant contribution of new chemical knowledge, and a written dissertation thereon, under the supervision of a faculty member. *Prereq.: Doctoral candidacy.*

IV. Electives

INT 3101 Biochemistry I

Discussion of the structures and chemistries of carbohydrates, proteins, lipids, nucleic acids, and se-

lected cofactors. *Prereq.: One year organic chemistry.*

INT 3102 Biochemistry II **2 Q.H.**

Discussion of enzymes, enzyme kinetics, and mechanisms of enzyme reactions, of intermediary metabolism and of bioenergetics, biological oxidation-reduction reactions and the electron transport chain. A consideration is made of carbohydrate metabolism including the glycolytic pathway, the citric acid cycle and the

pentose phosphate pathway. *Prereq.: INT 3101. Offered summer and winter quarters.*

INT 3103 Biochemistry III

Continuation or intermediary metabolism from Biochemistry II, including lipid, protein, and nucleic acid metabolism, photosynthesis, and cell regulation. *Prereq.: Biochemistry II, INT 3102.*

Economics

All courses carry three quarter-hours of credit unless otherwise specified.

ECN 3005 General Economics **0 Q.H.**

An intensive survey of macroeconomic and microeconomic concepts, theories and techniques for students with a limited background in economics or who need a refresher course.

ECN 3010 Introduction to Microeconomic Theory **0 Q.H.**

Intensive coverage of basic micro theory. This course is designed for M.A. degree students who need to improve their background in micro theory and carries no academic credit toward the M.A. or Ph.D. programs.

ECN 3020 Introduction to Macroeconomic Theory **0 Q.H.**

Intensive coverage of basic macro theory. This course is designed for M.A. degree students who need to improve their background in macro theory and carries no academic credit toward the M.A. or Ph.D. programs.

ECN 3030 Introduction to Mathematics for Economists **0 Q.H.**

This course helps acquaint the student with the matrix algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic, and exponential functions; and elementary differential and integral calculus. This course is designed for M.A. students who need to improve their background in mathematics and carries no credit toward the M.A. or Ph.D. degrees.

ECN 3040 Introduction to Statistics **0 Q.H.**

An introduction to statistical methods and techniques used in economic analysis. Descriptive statistics, time-series and index number problems, sampling problems, introduction to probability theory, and hypothesis testing. This course is designed for M.A. degree students who need to improve their background in basic statistics and carries no academic credit toward the M.A. or Ph.D. programs.

ECN 3110 Introduction to Microeconomic Theory **4 Q.H.**

An intensive coverage of basic microeconomic theory, covering consumption, production and cost theory, market structure and welfare economics. This course is equivalent to ECN 3010.

ECN 3120 Introduction to Macroeconomic Theory **4 Q.H.**

for M.S. students
An intensive coverage of basic Keynesian macroeconomic theory with an emphasis on analytical concepts and tools with some application to macroeconomic problems and public policy. This course is equivalent to ECN 3020.

ECN 3130 Introduction to Mathematics for Economists **3 Q.H.**

for M.S. students
Seeks to acquaint the student with the algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic and exponential functions; and elementary differential and integral calculus. This course is equivalent to ECN 3030.

ECN 3140 Introduction to Statistics **4 Q.H.**

for M.S. students
An introduction to statistical methods and techniques used in economic analysis. Descriptive statistics, time-series and index number problems, sampling problems, introduction to probability theory, and hypothesis testing. This course is equivalent to ECN 3040.

ECN 3150 Microeconomic Policy Planning Seminar **4 Q.H.**

Cost efficiency and effectiveness, assessment of externalities, shadow prices, benefit-cost analysis, project implementation and evaluation, budget analysis, evaluation of public programs, role of private and public sectors, relationship of projects and macro planning, use of analysis by policymakers. *Prereq.: ECN 3110, ECN 3140 co-requisite.*

ECN 3151 Macroeconomic Policy Planning Seminar **4 Q.H.**

Role of public sector in the economy. Socio-economic objectives and public policies. National economic planning and synthesis of models for growth and development. Tools and techniques for economic planning. Construction and utilization of input-output tables. Planning and policy implementation and evaluation. *Prereq.: ECN 3120, ECN 3140 co-requisite.*

ECN 3152 Workshop in Economic Planning and Policy

Empirical work involving micro and macro planning techniques, applying the latter to individual case studies of a specific plan, program, or organization.

Students are expected to prepare and present a research paper on a chosen case study, demonstrating the ability to use planning techniques. *Prereq.: ECN 3150 and ECN 3151.*

ECN 3210 Microeconomic Theory I **4 Q.H.**

Microeconomic theory at the M.A. level. An investigation of the equilibrium conditions in consumption and production and the theory of factor markets and efficiency. Various types of market structures are covered with respect to these areas. *Prereq.: ECN 3030/3130.*

ECN 3220 Macroeconomic Theory I **4 Q.H.**

Basic macroeconomic modeling and policy effectiveness. Theoretical debate on price level and output determination from the Monetarist, Keynesian, and Rational Expectations viewpoints. *Prereq.: ECN 3030/3130.*

ECN 3230 History of Economic Thought

This course is an inquiry into the development of economic thought. It focuses on the analytical innovations in economic thought, beginning with the Physiocrats and extending up to contemporary thinkers. The course stresses the persistence of certain topics, like money, capital accumulation, macroeconomic stability and value theory, throughout the development of economic thought and considers the historical policy issues that inspired different thinkers to address these topics in a new way.

ECN 3240 Statistical Inference **4 Q.H.**

A study of statistical methods and techniques. Probability theory and models, testing economic hypotheses, analysis of variance, ordinary least-squares regression, t-statistics and f-statistics. Correlation analysis. *Prereq.: ECN 3040/3140 or statistics examination.*

ECN 3241 Econometrics I **4 Q.H.**

Estimation of demand, supply, cost, and production functions; applications of multivariate analysis of economic data; identification; determination of trend, oscillation, and periodic movements; autocorrelation and correlogram analysis, trends in multiple regressions. *Prereq.: ECN 3240 or permission of instructor.*

ECN 3310 Case Studies in Applied Microeconomics

Topics in applied microeconomics. Case studies in organizational decision-making for such problems as short-run and long-run forecasting of demand, short-run and long-run cost and production decisions, competition and pricing strategies in different markets, financing of investments, and response to government regulations and taxation. *Prereq.: ECN 3010/3110 and ECN 3030/3130.*

ECN 3330 Economic Programming

Economic programming with emphasis on linear programming, simulation and queuing theory with applications to the computer. *Prereq.: ECN 3530.*

ECN 3332 Computers in Economic Research

This course is designed to provide an introduction to the use of computers in economic research. Topics to be covered include accessing the Northeastern

computer, descriptive statistics, regression analysis, matrix manipulation and FORTRAN or other programming languages. This course will combine classroom lectures with hands-on use of the computer. *Prereq.: ECN 3040/3140 or ECN 3240.*

ECN 3350 Economics of the Labor Market and Labor Force I

Labor force measurement and determinants, changes in labor force participation and composition. Micro-analysis of labor supply and demand. Varieties of labor markets and their functioning. Labor allocation and migration. Minimum wages. Applications of human capital theory to the labor force. *Prereq.: ECN 3010/3110.*

ECN 3351 Economics of the Labor Market and Labor Force II

Macro money-wage and employment determination in the short run. The Phillips curve and macro wage-price problems. Income policies, unemployment and underemployment. Technological change and changing skill requirements. Productivity measures, determinants and trends. Secular changes in real wages and employment. *Prereq.: ECN 3020/3120.*

ECN 3352 Economics of Manpower Planning I

The role of manpower planning and its integration with general development planning. Analysis and evaluation of different techniques of manpower planning. Technological versus economic methods. Practice of manpower forecasting and data problems. Skill training versus educational strategies. Models of educational planning and their applications to different countries. *Prereq.: ECN 3010/3110.*

ECN 3353 Economics of Manpower Planning II

Applications of manpower planning methods and techniques to problems of national economic development. Cost-benefit and cost-effectiveness of educational and manpower programs. Special problems of health manpower, scientists, engineers, and technicians. Evaluation of methods and prediction used in national manpower plans. *Prereq.: ECN 3352.*

ECN 3354 Economics of Medical Care and Health Manpower

The organization of medical care, the problems associated with various alternative delivery systems. The utilization and availability of physicians and other paramedical personnel, the growth and pressures exerted by third-party payers; and consideration of federal, state, and municipal participation in the delivery of quality medical care under various alternatives for national health insurance.

ECN 3355 Economics of Human Capital

An examination of the investments in human capital as applied to education, training, health, migration, family formation, and fertility. Empirical studies will be used to illustrate human capital theory and to evaluate its usefulness in both developed and developing economies.

ECN 3356 Local Labor Markets: Research Methods, Problems, and Planning

Analytical frameworks and empirical measures for determining the nature and operation of state and local labor markets. Techniques for planning human resource programs at state and local levels. Varieties of local labor markets; use of data from public agencies to examine such markets; composition of local labor force, sources of local labor supply, industrial and occupational mix, local wage and salary structures, and local income distribution.

ECN 3359 Seminar in Human Resource Development

Selected topics on the development and use of human resources. *Prereq.: Consent of instructor.*

ECN 3360 Regional Economics

Determinants of homogeneous regions. Theories of location for firms, industries, and people. Regional income accounting systems, and models of intra- and interregional income and output; economic impact analysis. *Prereq.: ECN 3010/3110.*

ECN 3362 Economics of Crime

A discussion of the resource allocation problem as it relates to criminal behavior and effective law enforcement. Evaluation of costs and benefits of alternative law enforcement policies. Criminal activity, including organized crime, is analyzed in an economic context.

ECN 3363 Urban Economic Systems

The economy of cities. Analysis of intrametropolitan spatial relationships including industrial location, and models of residential land, and housing markets. *Prereq.: ECN 3010/3110 and ECN 3030/3130.*

ECN 3364 Urban Economic Development

Problems in urban economics including segregation, housing, transportation, urban renewal, and related policy issues. *Prereq.: ECN 3010/3110.*

ECN 3366 Economics of Transportation

This course provides an application of microeconomic theory to transportation. Topics covered include: demand and demand estimation, cost and cost estimation, pricing and investment, and regulation and deregulation. Applications cover both urban and intercity passenger transportation as well as freight transportation. *Prereq.: ECN 3010/3110 and ECN 3030/3130.*

ECN 3369 Urban/Regional Economics Seminar

Selected topics in urban/regional economics. *Prereq.: ECN 3363 or ECN 3364.*

ECN 3370 Economic Development

A study of the prospects of economic growth in less developed areas. Measurement and theories of economic development. Role of human and natural resources, education, technology, and capital formation in national, regional, and sectoral development. Changes in institutions. *Prereq.: ECN 3010/3110, ECN 3020/3120 or consent of instructor.*

ECN 3371 Input-Output in Development

Methodology and applications of input-output techniques for planning and analysis in developing countries. National and multiregional input-output systems. *Prereq.: ECN 3332 or consent of instructor.*

ECN 3372 Comparative Economic Development

Methods and applications of comparative development study, measures and indicators of development, cross-country data analysis, comparative development systems plans vs. markets, and comparative development strategies. *Prereq.: ECN 3370 or consent of instructor.*

ECN 3373 Development Finance

Sources of investment finance in developing countries; role of taxation and tax structure reform; development of financial institutions and capital markets; private and official finance from abroad and debt-service problems; problems of monetary management and export instability.

ECN 3374 Comparative Economic and Business Practices in the U.S. and Abroad

Market structure and business organization, ownership, management and control in the U.S., O.E.C.D. and other developed countries; the influence of multinational enterprises. Labor markets and survey and case studies of industrial relations. Patterns and impact of government policies and national trade and finance patterns, volume and practices.

ECN 3375 International Trade and Finance

Classical and neoclassical theories of international trade. Balance of payments. Exchange rate determinants. Analysis of trade distortions. International financial markets. The international monetary system. Issues in international trade and finance.

ECN 3379 Development Planning Seminar

Political and economic plans. Survey of neoclassical growth models. Input-output techniques in open and closed models. Elements of linear programming; optimal decision techniques. Processes of implementation of planning; interaction of public and private sectors. Guide to empirical applications. *Prereq.: ECN 3120 or ECN 3220 and ECN 3370 or consent of instructor.*

ECN 3380 Monetary Theory

A study of the relationships between money and economic activity with emphasis upon various quantity theory models and theories of the demand for money and velocity. *Prereq.: ECN 3020/3120.*

ECN 3381 Monetary Policy

An analysis of monetary policy in the United States. A study of Federal Reserve objectives, policy instruments and techniques and their relationship to aggregate economic activity and financial markets. Recent developments and issues will be introduced.

ECN 3384 Capital Markets

Primary sources of savings and demand for financial assets; role of financial intermediaries; banking system and government lending agencies. Demand for funds and real investment—mortgage, corporate, and government securities markets; interdependence of rate structures. Flow-of-funds data in relation to national income accounts.

ECN 3389 Money, Credit, and Banking Seminar

Selected topics in the economics of money, credit and banking. *Prereq.: Consent of instructor.*

ECN 3390 Public Finance Theory I:**Public Expenditures**

Fiscal functions and institutions of government; public choice and fiscal politics, theory of public goods; public expenditure analysis and evaluation; fiscal federalism and relationships among governments at different levels, including intergovernmental grants. *Prereq.: ECN 3010/3110 and ECN 3030/3130.*

ECN 3391 Public Finance Theory II: Taxation

Fiscal functions of government; principles of taxation; problems of tax structure and reform at the national and local levels, tax incidence and equity; effects of taxation on economic efficiency and growth; issues of public debt and the deficit. *Prereq.: ECN 3010/3110.*

ECN 3392 Public Policy and Finance

Techniques of fiscal policy, fiscal policy norms, public sector debt; tax policy, federal tax reform; the conflict between social implications of price stabilization and full employment; public expenditure policy and the interrelation between monetary and fiscal controls. *Prereq.: ECN 3020/3120.*

ECN 3399 Seminar in Public Finance

Selected topics in public finance. *Prereq.: ECN 3390 and ECN 3391 or consent of instructor.*

ECN 3510 Microeconomic Theory II 4 Q.H.

Advanced topics in microeconomics related to consumption, production, and market imperfections. Theory of general equilibrium, welfare economics, second best, externalities and public goods. *Prereq.: ECN 3210 or equivalent.*

ECN 3511 Economics and the Law 1 Q.H.

Topics in the application of microeconomic principles to the law, such as property rights, torts, contract law, and the regulation of business. Limited to Law, Policy, and Society students. *Prereq.: ECN 3010/3110.*

ECN 3520 Macroeconomic Theory II 4 Q.H.

Theory and problems of macro-dynamics, growth, inflation, cycles, and stabilization policy. *Prereq.: ECN 3220 or equivalent.*

ECN 3530 Mathematics for Economics 4 Q.H.

Application of matrix algebra and simple multivariate calculus to economic analysis. Static optimization and dynamic analysis; difference and differential equations. Examples from economic theory. *Prereq.: ECN 3030/3130 or mathematics examination.*

ECN 3540 Econometrics II 4 Q.H.

Asymptotic and small sample properties of various estimators; rank-order conditions for identification; specification error and error in variables; remedies for autocorrelation and multicollinearity; dummy variables; distributed lags; forecasting and simulation; non-linear estimation; alternative estimation technique (two-stage least squares, three-stage least squares, maximum likelihood estimators, etc.) *Prereq.: ECN 3241.*

ECN 3601 Doctoral Research Seminar I 4 Q.H.

Prereq.: 12 Q.H. of field work and consent of instructor.

ECN 3602 Doctoral Research Seminar II 4 Q.H.

Prereq.: ECN 3601.

ECN 3798 Master's Thesis Continuation 0 Q.H.**ECN 3799 Doctoral Dissertation 0 Q.H.****Continuation****ECN 3850 Internship in Economics 1 Q.H.**

Academic credit for internship work in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3851 Internship in Economics 2 Q.H.

Academic credit for internship work in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3852 Internship in Economics 3 Q.H.

Academic credit for internship work in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3870 Readings in Economics 1 Q.H.

Supervised reading in selected topics in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3871 Readings in Economics 2 Q.H.

Supervised reading in selected topics in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3872 Readings in Economics 3 Q.H.

Supervised reading in selected topics in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3873 Readings in Economics 4 Q.H.

Supervised reading in selected topics in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3874 Readings in Economics 5 Q.H.

Supervised reading in selected topics in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

ECN 3875 Readings in Economics 6 Q.H.

Supervised reading in selected topics in economics. For Master's students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

- ECN 3880 Readings in Economics** **1 Q.H.**
Supervised reading in selected topics in economics. For Doctoral students only. *Prereq.: Consent of instructor and approval of Graduate Director.*
- ECN 3881 Readings in Economics** **2 Q.H.**
Supervised reading in selected topics in economics. For Doctoral students only. *Prereq.: Consent of instructor and approval of Graduate Director.*
- ECN 3882 Readings in Economics** **3 Q.H.**
Supervised reading in selected topics in economics. For Doctoral students only. *Prereq.: Consent of instructor and approval of Graduate Director.*
- ECN 3883 Readings in Economics** **4 Q.H.**
Supervised reading in selected topics in economics. For Doctoral students only. *Prereq.: Consent of instructor and approval of Graduate Director.*

- ECN 3884 Readings in Economics** **5 Q.H.**
Supervised reading in selected topics in economics. For Doctoral students only. *Prereq.: Consent of instructor and approval of Graduate Director.*
- ECN 3885 Readings in Economics** **6 Q.H.**
Supervised reading in selected topics in economics. For Doctoral students only. *Prereq.: Consent of instructor and approval of Graduate Director.*
- ECN 3890 Master's Thesis** **(maximum 6 Q.H.) Seminar**
Thesis supervision by members of the department; approval of graduate adviser required.
- ECN 3899 Doctoral Dissertation** **(no credit) Seminar**
Prereq.: Approval of graduate adviser required.

English

All courses carry three quarter-hours of credit unless otherwise specified.

- ENG 3300 Introduction to Literary Study**
Materials and techniques of research. Writing a research paper. Approaches to literary study with consideration of both traditional and contemporary views.
- ENG 3311 English Prose Style**
The development of prose style in English (chiefly expository), from the sixteenth century to the present. Most major authors are represented, from Roger Ascham to James Baldwin.
- ENG 3312 Theory and Teaching of Writing**
Designed for teachers or prospective teachers of writing in college or the public schools, this course examines several premises of writing instruction and how they can provide successful classroom practices.
- ENG 3315 Contemporary Critical Theory**
An introduction to the study of modern and contemporary literary theory and criticism: "New Critical," Marxist, psychoanalytic, structuralist, poststructuralist, phenomenological, and others.
- ENG 3317 Topics in Criticism**
Examines such topics in critical theory as narrative, cultural criticism, representation, reader response.
- ENG 3320 History of Criticism**
Study of the history of literary criticism from Aristotle to the present including such writers as Aristotle, Plato, Sidney, Johnson, Wordsworth, Shelley, Pater.
- ENG 3321 Linguistics and Literature**
Language viewed in its special function as literary medium. Linguistic approach to style, metaphor, form, and meaning. Representative works of major writers, poetry and prose, studied for characteristic formal properties. Discussion of contribution of linguistic analysis to literary criticism and to a theory of literature.

- ENG 3322 Linguistics and Writing**
Aspects of linguistics related to written forms of communication. Both fictional and nonfictional prose are represented. Topics in discourse analysis, textual cohesion, point of view and its effect on syntactic options, syntactic symbolism where syntax replicates meaning. Such problems as language and deception, speech and judgment, rhetoric and persuasion are also considered.
- ENG 3323 Theatrical Styles**
An examination of modern dramatic expression and theory with particular attention to absurdist drama, existentialist drama, and Brecht's theatre of alienation.
- ENG 3324 Perspectives on American Literature**
An attempt to discover common themes and recurrent patterns in American literature through a close reading of critics as various in their approach as Lawrence, Parrington, Chase, Pearce, and Fiedler.
- ENG 3325 Topics in Early American Literature**
Focuses on the work of one writer, a group of writers, or a theme or structure common to several writers—Jonathan Edwards, the poets of the seventeenth and eighteenth centuries, or typology, for example—in the first two hundred years of American literature. Topics change with time and demand.
- ENG 3326 Topics in Twentieth-Century American Literature**
Varied topics deal with twentieth-century American literature on a thematic, formal, generic, cultural, or interdisciplinary basis. Among the large number of possible topics are: Heroes and Antiheroes in Modern American Fiction, Twentieth-Century American Nature Poetry, Action Painting and the New York School, Women in Twentieth-Century American Literature, Surrealism in Modern and Contemporary

American Poetry, The City in Twentieth-Century American Literature, and Naturalism in the Modern American Novel.

ENG 3327 Major American Novelist

Examines in detail the work of a major American novelist and its historical context and cultural milieu; the work, for example, of Herman Melville, Mark Twain, Henry James, Willa Cather, Ernest Hemingway, or Saul Bellow.

ENG 3328 Major American Playwright

Examines in detail the work of a major American playwright and its theatrical style and social impact; the work, for example, of Eugene O'Neill, Tennessee Williams, Arthur Miller, or Edward Albee.

ENG 3329 Major American Poet

Considers in depth the work of a single major figure. Some likely subjects are: Whitman, Dickinson, Frost, Eliot, Pound, Williams, Stevens, and Lowell.

ENG 3330 American Drama

Surveys American drama from its political beginnings in the eighteenth century to the experimental variety of the twentieth, from Royall Tyler and William Dunlap to Eugene O'Neill and Imamu Amiri Baraka.

ENG 3331 Topics in American Literature

Varied topics deal with American literature on a thematic, formal, generic, cultural, or interdisciplinary basis. Among the large number of possible topics are: The *Isolato* in American Literature, Typology and American Art, Written Women and Women Writers, Realism in American Literature, Southern Literature, Humor in American Literature, The Frontier in American Writing, Local Colorists, and "The Machine in the Garden."

ENG 3348 Materials and Methods for Technical Writing

This course will examine research sources in science, technology, and various professions. Such sources include computer searches, on-line data, corporate holdings, and specialized publications in engineering, computer science, the sciences, medicine, and business. Examples are the *IEEE Transactions*, the *New England Journal of Medicine*, U.S. Government publications, and the like. (An annotated list of technical reference guides appears in Houp and Pearsall's *Reporting Technical Information*.)

The course will also explore interviewing experts and using nonprint media as resources in science, technology, and business.

In addition, the course will examine style guides particular to branches of technical and scientific writing.

ENG 3349 Workshop in Writing for Publication

This course will examine published articles in scientific, technical, and professional journals and magazines. The articles will be evaluated for content, style, tone, format, and mechanical details. Students will evaluate the article's success, its professionalism, its appropriateness and timeliness, and the professional standards of the journal. Concurrently, stu-

dents will research, write, and revise an article for submission to a professional journal of their choice. Members of the class will review and edit these articles before submission. The goal of the course is to have an article accepted for publication.

ENG 3350 Creative Writing I

Prose fiction.

ENG 3351 Creative Writing II

Poetry.

ENG 3352 Writing for the Professions

This course examines the various forms of business communications and offers practical experience in writing business letters, memoranda, case studies, proposals, and reports. For students in the Graduate School of Business Administration.

ENG 3353 Problems in Writing

This course examines writing problems in general as well as those which are specific to professional interests.

ENG 3354 Technical Writing

Technical writing assignments, including correspondence, description, instructions, proposals, and reports. Use of graphics, layout techniques, and visual aids. Emphasizes audience definition, editing, and rewriting.

ENG 3355 Topics in Technical Writing

Writing assignments related to computers and the computer industry. Preparation of operator's manual and program documentation (instructions for running a program in a programming language such as BASIC or PASCAL). Course offers experience in editing and revision and work with graphics and layout in preparing assignments.

ENG 3356 Technical Writing Theory and Practice

In this course we will examine the theory underlying the practice of technical writing, drawing on the disciplines of linguistics, rhetoric, psychology, and philosophy. We will analyze models of technical writing to develop a sense of the effective use of the principles we discuss. The course format will be a seminar. Course requirements include two oral presentations to the class, and a final paper applying some aspect of technical writing theory. Texts: Williams, *Style*; Kolin & Kolin, *Models for Technical Writing*; Anderson, Brockmann & Miller, *New Essays in Technical and Scientific Communication: Research, Theory, and Practice*.

ENG 3357 Computers and Writing

An introductory course. Will explore the two major uses of computers in writing instruction: word processing and computer-assisted instruction. The word processing strand will concentrate on the rudiments of word processing, hands-on experience, classroom exercises, and teaching strategies. The computer-assisted instruction strand will include demonstrations of prewriting, organizing, and revis-

ing software, as well as strategies for developing CAI in composition, and a brief introduction to a programming language.

ENG 3358 Topics in Nonfiction Prose

This course will examine writings in nonfiction prose in such areas as biography, history, science, and technology. The content of the course will vary according to the design of the instructor.

ENG 3359 Writing Workshop

This course is designed to provide advanced training in varied forms of writing. In different years, the topics could be such specialized areas as fiction, poetry, professional writing, and writing for academic administrators. In this course, intensive writing will be expected by the student and extensive comment by the professor.

ENG 3360 Writing Workshop

This course is designed to provide advanced training in varied forms of writing. In different years, the topics could be such specialized areas as fiction, poetry, professional writing for academic administrators. Intensive writing will be expected by the student and extensive comment by the professor.

ENG 3361 Topics in Literary Study

Varied topics will deal with literature on a thematic, formal, or generic basis. Some possible topics might be: Literature in the Jazz Age, The Tragic Hero, The Poetry of Nature. Topics will vary from year to year.

ENG 3367 Publications Management

This course introduces students to the principles of publications management, covering the five topics of design, writing, editing, production, and evaluation. Discussions and demonstrations cover the techniques as well as the principles of publication, design and production, with emphasis on current technologies used to prepare in-house documents. The problem of matching form and style to audience receives special attention.

Students make a site visit to observe a large in-house production facility. In addition to individual work, students collaborate in small groups to plan, write, and produce a major document.

ENG 3368 Writing for the Computer Industry

In this course, students have the opportunity to write and edit professional-quality computer documentation. Beginning with basic instruction sets, the assignments increase in difficulty, preparing the students to write a user's guide as a major project for the quarter. The second major project is a more abstract paper examining trends within the computer industry. The course focuses on techniques for creating *readable* documentation, including attention to formatting, graphic design, and text organization. No exams.

ENG 3369 Graphic Design for Technical Writers

An introduction to the methodology, tools and techniques used in the design and production of promotional and technical print materials. Students will

explore the nature of graphic design from both an objective and subjective point-of-view acquiring skills necessary to interface with designers so that their writing becomes consistent with the purpose and objectives of a publication. The course will utilize a case study approach and selected hands-on studio projects.

ENG 3370 Technical and Scientific Editing

The fundamentals of editing as they apply to science, technical, and engineering writing. The course covers: the role of the editor in business, industry and the sciences; basic editorial services such as copy and content editing, production editing and project editing; the editor as writer and interviewer; science interpretation and technical translation.

ENG 3380 Prose Writing I

This is a course in the writing of various types of nonfiction prose, including reviews, reports, biography, commentary, research, personal narrative, travel, and others developed by the participant in consultation with the instructor. The course will focus on concepts of content, point of view, organization, style, and stages of composition.

ENG 3381 Prose Writing II

This course continues Prose Writing I. The goal of the course is to reinforce writing theory and practice, to introduce the professional concerns of writers, and to prepare writing for possible publication. Participants will refine techniques of composition and will examine the rhetorical methods of description, narration, exposition, and persuasion. The course will review such writers' markets as newspapers, popular magazines, and scholarly journals. When possible, professional writers will be featured as guest speakers.

ENG 3382 Responding to Writing

This course examines and puts into practical use a variety of methods of analyzing expository writing. Participants will study both professional and student writing. They will be provided with the tools for analyzing and improving their own writing, assessing the writing of their students, and designing appropriate writing assignments and activities. This course will be an opportunity to begin the development of an integrated writing curriculum from the elementary to the college level.

ENG 3383 The Composing Process

This course is based on the premise that the key to teaching writing is teaching revision strategies. In this course, participants will look at the research studies of elementary, secondary, and college students and examine the manuscripts of professional writers such as E.B. White. Focus will be on both the theory and practice of revising. Issues to be covered include: understanding students' assumptions about the writing/revising process; teaching revision strategies; using student writing to teach revision; responding to student writing within the context of

revising; analyzing personal revision strategies; how participants can use what they know about their own revising strategies to teach revision.

ENG 3384 Rhetorical Theory

This course will trace the history of rhetoric and examine the major contemporary theories in the field. Consideration will begin with the classical rhetoric of Aristotle, Plato, Cicero, and Quintilian and end with the modern formulations of rhetoric by I.A. Richards, Philip Wheelwright, Alexander Bain, James Moffett, and James Kinneavy.

Rhetoric will be examined in terms of traditional modes of classifying discourse—description, narration, exposition, and persuasion—as well as modern reclassifications—expressive, referential, literary, and other modes. The course will also review rhetorical strategies for invention in the composing process: Burke's dramatistic method, Rohman's prewriting, and Pike's tagmemics.

ENG 3385 Writing about Literature and Other Disciplines

This course will examine some characteristic student and professional writing in the humanities, sciences, and social sciences.

The goal of the course is to help participants see how students can use writing as a way of knowing and learning, not just in the English class but, for example, in the biology, history, or even mathematics class as well.

ENG 3386 Research in Composition

The goal of this course is to prepare publication of research by providing a working knowledge of sources, current scholarship, and standards of publication. To this end, the course will acquaint participants with various bibliographies, journals, texts, and monographs that constitute the important documents of the field. Participants will use these documents to pursue research topics in invention, structure and form, modes of discourse, the composing process, and pedagogy.

ENG 3387 Case Study Design

This course will prepare participants for research to be conducted in Field Work during the academic year at the home institution. Participants will examine some published case studies of teaching and writings, and will explore relevant methods of data analysis, observation techniques, interview and questionnaire construction, sampling procedures, experimental design, and writing protocol analysis.

ENG 3388 Field Work

During the academic year, participants will conduct the independent research planned in Case Study Design.

The resources available for this research at the home institution will include the participants' individual teaching practices, course or departmental curriculum, the writing of their students and of students in other classes, the practices of other teachers and

administrators, as well as published books, reports, and articles on composition. They will collect, collate, and interpret data according to the guidelines established at the institute. They will then prepare a project in which they present their findings.

ENG 3389 Case Study Analysis

Participants who have prepared Field Work projects will present their findings, draw their conclusions, and discuss the implications of their research for further study. Participants will be guided toward possible publication of their work in relevant composition journals.

This course concludes the Case Study Design, Field Work, and Case Study Analysis sequence.

ENG 3400 Issues in English Grammar

Methods and analytic procedures (but not the formalism) of modern linguistics are used to justify and support categories, distinctions, and structure used to describe sentences. These categories, distinctions, and structures will come mainly from the framework of traditional grammar. However, the inconsistencies and arbitrariness common in traditional grammar will be replaced by modern analyses, informally presented.

ENG 3401 Semantics

The relation between language and behavior; the concept of change, variety, and uniqueness; symbols, levels of abstraction, habits of evaluation of linguistic phenomena; representation of meaning in language.

ENG 3402 History of the English Language

Topics include the development of the sound system from Old English to the present; changes in the inflectional system and corresponding developments in sentence structure; processes of word formation and shifts in meaning. Poetry, prose, and nonfictional readings supplement the text.

ENG 3403 Topics in Linguistics

Subject to be announced.

ENG 3404 Introduction to Linguistics

Introduction to the study of language, the principles and methods of linguistic description; the development of the science of language, of descriptive and generative linguistics. Emphasis on goals of modern linguistic theory.

ENG 3406 Introduction to Syntax

Deep and surface structures and transformations necessary to generate the latter; graphic representations of structure; deep-structure nature of adjectives, pronouns, prepositions, auxiliaries, possessives, comparison with traditional grammar.

ENG 3407 Children's Literature

A study of history and major forms of children's literature in the English language. The course covers such topics as folktales and folklore, novels, poetry, and informational books and includes cultural and sociological theories of childhood and adolescence.

ENG 3408 Literature and the Visual Arts

Examination of the complex relationships between literature and visual arts. Consideration of such topics as theoretical approaches to this relationship, the work of painter-poets, verbal descriptions of art (e.g., poems about paintings), works in which verbal and visual art are integrated.

ENG 3409 Literature and Psychology

An examination of theoretical positions and practical problems in the relationships between literature and psychology. Psychological interpretations of lyrics, works of fiction, and dramas are examined. In addition to the selected essays on certain literary works, several theoretical texts are studied.

ENG 3410 Short Fiction

The short stories of Sherwood Anderson and Ernest Hemingway and their contribution to American literature.

ENG 3411 Comic Drama

The Comic Spirit and its manifestations in dramatic literature and performance. The nature and forms of comic playwriting from Aristophanes to the present. An examination of the theater's comic forms: farce, comedy, satire, parody.

ENG 3412 Tragic Drama

This course considers important theories of tragedy and certain plays in an effort to consider the relation, if any, which exists between theory and practice of the tragic genre.

ENG 3414 Satire

A theoretical study of satiric forms—Roman, renaissance and neoclassical verse satire, and later satiric narratives. Writers surveyed can include Horace, Juvenal, Pope, Swift, Voltaire, Byron, Evelyn Waugh.

ENG 3415 Literary Impressionism

Intensive study of this theory of impressionism (with some attention to music and painting as well as literature) and its role in literary history. Readings explore French, British, Scandinavian, and American writers, especially Crane, Ford, Conrad, James, Moore, Hemingway, and Faulkner.

ENG 3416 Twentieth-Century British Drama

The course explores the evolution of British drama from Shaw to Tom Stoppard, giving particular attention to the influence of Ibsen and later European dramatists; the Irish influence of Yeats, Synge, and O'Casey; the traumas of two world wars; and the steady growth in the variety and power of British dramatic productions. Among the writers to be studied, in addition to those already mentioned, are Arthur Wing Pinero, John Galsworthy, D.H. Lawrence, Samuel Beckett, James Osborne, Terrence Rattigan, and Harold Pinter.

ENG 3417 Topics in Twentieth-Century European Literature

Examination of such topics in continental literature of the period as literary movements (e.g. surrealism,

modernism), major writers (e.g. Camus, Mann, Kafka), or genres (e.g. short fiction, drama).

ENG 3418 Topics in Twentieth-Century Literature

Examinations of such topics in world literature as regional literature (e.g. Latin-American writing, Japanese fiction), or literary movements (e.g. post-modern fiction).

ENG 3419 Topics in Genre

Examines such topics in genre criticism as biography, autobiography, epic poetry, lyric poetry.

ENG 3550 Classical Backgrounds

Readings in translation of Greek and Roman literature pertinent to the study of English and American literature. Focus upon the development of genre and theme.

ENG 3551 Chaucer's *Troilus and Criseyde*

A detailed examination of the poem.

ENG 3552 Chaucer's *Canterbury Tales*

Selected *Canterbury Tales*.

ENG 3553 Middle English Lyrics and Drama

A study of the epic and romance, concentrating on the transformation of the epic to the courtly hero: works to include in translation *Beowulf*, *Chretien de Troyes*, *the Niebelungenlied*, and *le Morte D'Arthur*.

ENG 3554 Studies in Fourteenth-Century Literature

Major works in non-Chaucerian Middle English including *Sir Gawain and The Green Knight*.

ENG 3555 Tudor Poetry

Wyatt and Surrey, Sidney, Marlowe, Spenser, Shakespeare: the poems of courtly love and the reaction against it.

ENG 3556 Renaissance Drama

Twelve representative Elizabethan and Jacobean comedies and tragedies.

ENG 3557 Shakespeare's Histories

The English history plays from *Richard III* to *Henry V*, plus *Titus Andronicus*, *Julius Caesar*, and *Troilus and Cressida*.

ENG 3558 Shakespeare's Tragedies

Eight plays from *Richard II* to *Antony and Cleopatra*.

ENG 3559 Shakespeare's Comedies

Eight plays from *Comedy of Errors* to *The Tempest*.

ENG 3560 Problems of Shakespearean Interpretation

A study of various "problematic" plays; a general knowledge of Shakespearean drama and the sonnets is presumed.

ENG 3561 Seventeenth-Century Literature

Major prose and poetry of the seventeenth century, excluding drama: Bacon, Hobbes, Browne, Bunyan, Donne, Herbert, Johnson, Marvell, and others.

ENG 3562 Milton's Major Poetry

Milton's poetic and intellectual achievement is studied through analysis of his major works. Particular emphasis is given to *Paradise Lost* as an expression of Renaissance humanism and the culmination to the epic tradition.

ENG 3563 Restoration and Early Eighteenth-Century Literature

A critical study of neoclassical drama, poetry, and criticism; Restoration drama, Dryden, Pope, Addison, Steele, and Gay.

ENG 3564 Age of Johnson

Johnson, Boswell, and the Club: Burke, Goldsmith, and Gibbon; poetry of Cowper, Gray, Burns, and Smart.

ENG 3565 Topics in Augustan Literature

Subject to be announced.

ENG 3566 Eighteenth-Century Fiction

Novels by Defoe, Fielding, Richardson, Smollett, Sterne, and Austen.

ENG 3567 Individual Eighteenth-Century Novelist

Subject to be announced.

ENG 3568 Romantic Poetry

A survey of representative forms and works of the major poets of the English Romantic Period (1798-1832): Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. The poetry will be studied in the historical and intellectual context of its time.

ENG 3569 Romantic Literature

A survey of representative forms and works of English Romantic prose—both fiction and nonfiction. Examples may be drawn from the fiction of Austen, Hogg, Scott, and the Gothic novelists, as well as from the nonfiction prose of Coleridge, De Quincey, Hazlitt, Lamb, and Shelley. Other texts may be used as needed to illustrate or amplify the ideas expressed in the prose.

ENG 3570 Topics in Romanticism

Romantic attitudes toward mankind in relation to self, society, and the universe, and Romantic attitudes toward the individual person as poet, with the impact these attitudes have upon the form and thematic substance of authentic and fictional autobiography in poetry and prose. May include an intensive reading of one major British writer whose attitudes, themes, style, and philosophy are representative of the Romantic Era (1794-1832).

ENG 3571 Victorian Literature

General survey touching upon major genres in Victorian literature with emphasis on the transition from the Victorian to the "modern," including such writers as Carlyle, Ruskin, the Brontes, Swinburne, Pater, Wilde.

ENG 3572 Victorian Poetry

A close study of Tennyson, Browning, Arnold; also the pre-Raphaelite circle and the movement toward modernism: D.G. Rossetti, Swinburne, G.M. Hopkins.

ENG 3573 Victorian Novel

Close study of major works by Dickens, Eliot, the Brontes, Hardy.

ENG 3575 Topics in Victorian Literature

Subject to be announced.

ENG 3577 Twentieth-Century British Poetry

The poets covered in this course will be drawn from among such names as Hardy, Yeats, Auden, Dylan Thomas, Ted Hughes, Philip Larkin.

ENG 3580 Twentieth-Century British Fiction

Major figures of the modern and the contemporary periods: Conrad, Joyce, Cary, Beckett, Braine, Fowles, Snow, Lawrence, Woolf, Murdoch, Lessing, Huxley.

ENG 3582 Topics in Irish Literature

Examination of such topics as the Irish Renaissance, Irish short fiction, the Irish novel.

ENG 3583 Early American Literature

A survey of American literature during its first two centuries, from the puritans to the Knickerbockers, from William Bradford to James Fenimore Cooper.

ENG 3585 Topics in Nineteenth-Century American Literature

Subject to be announced. Recent examples include: Transcendentalism, the literature of the Civil War, the literature of social reform.

ENG 3586 Nineteenth-Century American Prose, 1820-1865

This course will focus on the characteristics of the Romantic movement and New England Transcendentalism as we find them in the works of the principal prose writers of the period. The particular themes and techniques of such writers as Poe, Hawthorne, Melville, Emerson, and Thoreau will be determined by close readings of their texts.

ENG 3587 Nineteenth-Century American Poetry

Subject to be announced.

ENG 3589 Nineteenth-Century American Prose, 1865-1900

This course deals primarily with the post-Civil War novel in America, including the realistic and naturalistic movements, and such authors as Twain, Howells, and Henry James. It will also include some notable nonfiction writers, such as Henry Adams and William James.

ENG 3591 Modern American Poetry

Twentieth-century poets who have struggled to establish a tradition for American poetry and whose examples have dominated poetry up to the present: Robinson, Frost, Stevens, W.C. Williams, M. Moore, Eliot, Pound, Crane, Cummings, and the Fugitives.

ENG 3592 Modern American Drama

Philosophic and aesthetic trends among such playwrights as O'Neill, Williams, Miller, Albee, Simon, and others.

ENG 3593 Individual Modern American Poet

Subject to be announced.

ENG 3594 Contemporary American Prose

Concentrates on the novel in exploring developments in American prose since 1945. Among writers likely to be considered are: Mailer, Bellow, Malamud, Barth, Heller, Walker, Pynchon, Vonnegut, and Hawkes.

ENG 3595 Individual Modern American Novelist

An in-depth examination of the work of a major figure in American fiction, focusing on the cultural context out of which he or she emerges. Recent selections for this course have been Hemingway, Fitzgerald, Mailer, Faulkner, and Bellow.

ENG 3596 Individual American Writer

Subject to be announced.

ENG 3597 Contemporary American Poetry

Subject to be announced.

ENG 3598 Modern American Prose

Includes close examination of such prose forms as the essay, short story, autobiography, biography, history, and novel. Writers may be selected with some special purpose in view, but are generally representative of the 1912-1950 period.

ENG 3600 Topics in Nineteenth-Century European Literature

Examination of such topics in continental literature of the period as literary movements (e.g. realism, decadence), major writers (e.g. Balzac, Flaubert, Dostoyevsky), or genres (e.g. novel, drama).

ENG 3601 Thesis

Six quarter-hours maximum; by arrangement.

ENG 3602 Independent Study

By arrangement.

ENG 3603 Independent Study—Certificate of Advanced Graduate Study

By arrangement. Limited to students in the Certificate of Advanced Graduate Study program.

ENG 3604 Independent Project, Technical and Professional Writing

Preparation of portfolio of technical and professional writing done for final project. Limited to students in Master of Technical and Professional Writing program.

ENG 3610 Contemporary American Fiction

A survey of the major developments in American fiction of the period from roughly 1945 to the present against the cultural background of that period. It will consider such categories as Southern fiction, Jewish fiction, Black fiction, Women's fiction, and such writers as Mailer, Kerouac, Welty, Malamud, Didion.

History

All courses carry three quarter-hours of credit except seminars, which carry four quarter-hours, and other courses where noted.

HST 3241 Methodology

The objectives, methods, and resources of the historian.

HST 3242 European Historiography

The development of historical writing from ancient times to the present.

HST 3243 American Historians

The writing of American history by Americans, from colonial times to the present, with emphasis on changes in both form and substance.

HST 3318 Imperialism (Group I)

The rise and development of colonial empires with emphasis on the 19th century. The nature of empire, motives for imperial expansion, and the colonial heritage.

HST 3322 Socialism and Revolution (Group I)

Studies in the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

HST 3339 The Modernization of Ireland (Group I)

Analysis of themes in the growth and development of modern Ireland. Topics examined include migration and its effects on a traditional society, the role of religion in the assertion of national independence, and modernization within the British nexus.

HST 3345 Hitler's Germany (Group I)

A study of the history of the Third Reich, including an in-depth analysis of the process by which the political motives and methods of the Nazis ultimately won the support of the German people.

HST 3380 Seminar in the Renaissance (Group I)

Research and writing concerning the Renaissance.

HST 3381 Seminar in the Reformation (Group I)

Research and writing concerning the Reformation.

HST 3384 Seminar in Twentieth-Century Europe (Group I)

A study of a selected controversy in contemporary European history.

HST 3385 Seminar in European Social History (Group I)

Focusing on Britain, France, and Germany in the nineteenth and early-twentieth centuries and looking at history "from below," this course examines comparative issues in European social history. Topics include the nature of social protest, the rise of organized labor, and the impact of war and revolution on the lives of ordinary people.

HST 3386 Seminar in Imperialism (Group I)

An inquiry into the motives underlying European expansion in the late nineteenth century.

HST 3389 Seminar in Modern France (Group I)

Research, writing, and collective analysis of several themes in modern French social history since 1789,

including the role of social class in revolutionary protest, industrialization, technology and modernization, the rise of the working class and the development of organized labor, the French peasantry in an industrial society, the nature of the family, and women's roles.

HST 3397 Seminar in Comparative Labor History

Analysis of issues in the history of the European labor movement, focusing on nineteenth and twentieth century Britain, France, and Germany. Issues include: the meaning of the concept of class in labor history; labor movements and politics (working-class conservatism and working-class radicalism); the place of women in the working class and in the labor movement; worker responses to mechanization, automation and scientific management in the twentieth century.

HST 3399 Seminar in Approaches to Women's History (Groups I, II, or III)

Study focuses on current issues in women's history and the methods historians use to study women's historical roles in the market place, work force, political arena, and domestic scene in Europe, Asia, the United States, and Latin America. Emphasis is on the importance of comparative and interdisciplinary approaches to the history of women. The seminar includes lectures and discussions with specialists using various approaches, assigned reading, and an independent project.

HST 3405 Colonial America: The Eighteenth Century (Group II)

The expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England to 1763.

HST 3410 Topics In American Reform (Group II)

Selected studies of movements to change aspects of American society.

HST 3413 Topics in the Civil War and Reconstruction (Group II)

Analysis of key issues surrounding the events leading up to the Civil War, the war itself, and the Reconstruction period.

HST 3421 Political Change in Twentieth-Century America (Group II)

Analysis of the growth of governmental function and structure, emphasizing the evolution and administration of leading policy concerns of the current century, changes in federalism and intergovernmental relations, and patterns of popular political participation and thinking.

HST 3423 The Age of Roosevelt (Group II)

An analysis of the foreign and domestic policies and programs of the four Roosevelt administrations, set within the context of the world-wide depression and global war. Emphasis is on the range of recent interpretations and analytic methods used in evaluating the place of Roosevelt in American history.

HST 3434 American Social History Twentieth Century (Group II)

The transformation of the naive and idealistic America of the early twentieth century to life in a world in which technology has far outstripped man's mental and moral capacity to cope with it.

HST 3440 African-American History I (Group II)

The history of African-Americans to 1900, with emphasis on the role of black people in slavery and freedom.

HST 3441 African-American History II (Group II)

The history of African-Americans since 1900.

HST 3450 Boston as a City (Group II)

An in-depth examination of historic Boston from 1822 to the present. Emphasis is on Boston's early growth as a city, the Hub as a center of pre-Civil War reform, the coming of the Irish, Boston as America's Athens, the revolutionary shift from Yankee to Irish political domination, the flamboyant era of James Michael Curley, and the development of the "New Boston."

HST 3480 Seminar in American History (Group II)

Research and writing on selected aspects of American history.

HST 3482 Seminar in American Governmental History (Group II)

Concentrated attention to a particular problem or theme in American governmental history, emphasizing individual student research and writing.

HST 3485 Seminar in African-American History (Group II)

Research and writing on an aspect of African-American history.

HST 3486 Seminar in Recent American History (Group II)

Special topics from the period 1896 to the present studied in detail. Students are expected to present a research paper on a major person, action, or movement.

HST 3501 History of Exploration (Group III)

A comprehensive survey of exploration from ancient times to the present with emphasis on the motives for exploration and their impact on the regions discovered and on those doing the discovering.

HST 3505 Canada and the United States (Group III)

How and why a separate Canadian nation managed to emerge despite decades of American political and military threats. Examination also includes Canada's subsequent response to growing cultural and economic domination by the United States.

HST 3508 Modern Africa (Group III)

A topical approach to the history of Africa since 1850.

HST 3509 Pan-Africanism (Group III)

Black political thought in Africa and the Americas during the nineteenth and twentieth centuries in the context of modern nationalism and capitalism.

HST 3510 History of the Islamic Peoples (Group III)

A study of the history, culture, and religion of the followers of Muhammad from 600 to 1800.

HST 3512 Modern Middle East (Group III)

A study of the Middle East in the twentieth century.

HST 3531 Population in History (Group III)

An application of demographic theory to history.

HST 3601 Historical Administration (Group III)

The administration of historical agencies with attention to problems of finance and personnel and to the legal-governmental environment in which agencies operate.

HST 3602 Historical Societies and Archives (Group III)

The varieties of historical societies (local, state, and national) and the kinds of private (business, college, church) and public (local, state, and national) archives; their activities and procedures; their similarities and differences.

HST 3603 Historical Exhibits and Museums (Group III)

Approaches, techniques, and special problems in the presentation of history to the public through exhibits, films, and other audiovisual and written media. Guest lecturers from the field present lectures, and students have the opportunity to gain practical experience.

HST 3605 Historical Editing (Group III)

A laboratory for the study and practice of historical editing. Students are introduced to the major collections of edited papers and instructed in editing historical documents. Each student is given an historical document to prepare for publication. Instruction also covers the editing of history books and journals.

HST 3610 Industrial Archeology (Group III)

An introduction to the history, practice, and place of industrial archeology. There will be examination of techniques and procedures used to unearth the industrial past. Field trips to local industrial sites will be taken.

HST 3611 Historic Preservation (Group III)

An introduction to historic preservation, with attention to the history, the philosophy, and the practical problems of preservation.

HST 3620 Oral History (Group III)

The theory and practice of creating, processing, and using primary source material obtained by taping interviews with people whose role in history would otherwise go unrecorded.

HST 3621 Genealogical Research: Methods and Uses (Group III)

An analysis of the tools and sources available to genealogists and historians with attention to historical applications of such data. Students will have opportunity to use various records essential to the writing of family history.

HST 3622 Local History Methodology (Group III)

An examination of the development and uses of local history with special attention to the methodological aspects of this rapidly growing field. Students will have the opportunity to survey resources for a local community, prepare a demographic essay, and examine recent scholarship in local history.

HST 3625 Media and History (Group III)

Students will have the opportunity to explore such topics as the advantages and drawbacks of specific media, the uses and abuses of media in research and teaching, and the construction of media. Each student is required to participate in a research project involving the creation and/or evaluation of historically valid films, slide tapes, and other materials.

HST 3805 Assigned Reading**1 Q.H.**

Assigned reading under supervision of a faculty member.

HST 3806 Assigned Reading**2 Q.H.**

Assigned reading under supervision of a faculty member.

HST 3807 Assigned Reading**3 Q.H.**

Assigned reading under supervision of a faculty member.

HST 3811 Thesis**3 Q.H.**

Thesis supervision by members of the department.

HST 3812 Thesis**3 Q.H.**

Thesis supervision by members of the department.

HST 3813 Thesis**3 Q.H.**

Thesis supervision by members of the department.

HST 3821 Fieldwork in History I**4 Q.H.**

Fieldwork offers students the opportunity to get practical experience in historical agencies (including historical societies, archives, museums, exhibits, restorations, preservation projects, and the like). Students are required to work in the agency eight to ten hours a week for one quarter under the direction of an agency supervisor and departmental adviser.

HST 3822 Fieldwork in History II**4 Q.H.**

A second opportunity for students to acquire practical experience in an historical agency. The fieldwork placement requires eight to ten hours a week for one quarter under the direction of an agency supervisor and a departmental adviser.

HST 3823 Fieldwork in History III**4 Q.H.**

A third opportunity to acquire practical experience in an historical agency. The fieldwork placement requires eight to ten hours a week for one quarter under the direction of an agency supervisor and a departmental adviser.

Journalism

All courses carry four hours credit unless otherwise specified.

JRN 3432 Local Government Reporting

Coverage of town/city government, with emphasis on the "beat" approach to reporting public affairs. Practical experience is emphasized in such projects as covering town meetings, boards of selectmen and other commissions and boards.

JRN 3501 History of Journalism

Examination of American journalism from European and English roots. The colonial press, the great personal journalists of the 19th century, and the impact of major technological changes in the news media in the 20th century are among topics covered.

JRN 3508 Law of the Press

Examination of libel, invasion of privacy, access to government information, and other legal matters pertinent to the news media and stories they produce.

JRN 3512 Journalism Ethics and Issue

Responsibilities of news media; ethical problems confronting decision makers in various journalistic fields: the principles found in codes of the American Society of Newspaper Editors, the Associated Press Managing Editors, the Society of Professional Journalists, and other organizations.

JRN 3575 News Media Management

Examination of the organizational structure, production methods, management procedures of news media companies. Interaction of business, promotion, advertising, production, and circulation departments and their interaction with the market served.

JRN 3617 The Constitution and Mass Communications

The meaning of freedom of the press is explored through study and discussion of the First Amendment and various sections of the U.S. Constitution. The impact on the news media of evolving Supreme Court interpretations of the Constitution are examined.

JRN 3677 The News Media Mix and Its Environment

The media mix and issues facing the overall management of the news media. Such issues include group ownership, postal regulations, specialization of content, taxation laws, competition, audience definition, and new technologies.

JRN 3678 Applied Leadership Techniques

Establishing and maintaining internal communications, coaching, developing employees, understanding motivations, solving problems, making decisions, redesigning jobs, and analyzing leadership styles for news media application.

JRN 3679 Research Methods in Journalism

Examines the quantitative and qualitative methods of scientific inquiry as they relate to the journalist as a social scientist. Random sampling, content analysis, field experiments and basic statistics are covered.

JRN 3682 Mass Communication Theories

The major theories regarding the process, nature and influence of mass communications are examined. Communications is studied in a theoretical and research-oriented context.

JRN 3684 Literature of Journalism

Numerous authors and observers of the journalism profession are studied via their works. These authors include both journalists and non-journalists, and taken together they provide a wide-ranging view of journalism, its nature and impact.

JRN 3691 Professional Paper

Analyzing a publication by the case method, using theoretical and practical perspectives; analyzing weaknesses and strengths and posing possible solutions.

JRN 3870 Graduate Seminar

This course examines the mass media as an integral institution in society, focusing on topics of current significance.

JRN 3890 Directed Study 3891

Students work on individual projects under the supervision of an instructor. May be repeated once.

JRN 3897 Thesis (8 credits)

JRN 3898 Specialized Reporting Practicum (8 credits)

Reporting on a specialized area that is chosen by the student and the adviser. Several in-depth pieces will result and will be presented for publication to appropriate newspapers and/or magazines.

Law, Policy, and Society

Core Courses

INT 3249, 3250 Law, Policy, and Society Survey **Interdisciplinary, 4 Q.H.**

This course introduces students to a range of methodologies and perspectives from several disciplines that are employed in the study of law and society. Among topics to be examined are issues such as normative vs. formative functions of law, social control vs. individual freedom, and legal bases of conflict management in society. Although the course is coordinated by one instructor, faculty affiliates of the program participate in the course, permitting approaches and specific content to be presented and discussed from a variety of informed perspectives.

LAW 2364 Legal Research and Bibliography **Law, 1 Q.H.**

This course is open only to students in the Law, Policy, and Society Program. It is designed to introduce them to the resources and the use of the Law Library and the basic techniques of legal research.

SOC 3113 Introduction to Research Methods **Sociology, 2 Q.H.**

An introduction to methods of social research including such approaches as field study and partici-

pant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and uses of available data. Open only to Law, Policy, and Society students.

SOC 3114 Introduction to Quantitative Research Methods **Sociology, 2 Q.H.**

An introduction to quantitative techniques of analysis of policy. Students are expected to conduct individual projects. Open only to Law, Policy, and Society students. *Prereq.: SOC 3113 or its equivalent.*

INT 3650 Seminar in Law, Policy, and Society **1 Q.H.**

This is a course on how to construct and evaluate the design of research. Students will make two presentations in the seminar of their dissertation proposal and research design, their state of the art paper, or of their progress in any of these requirements. They will be joined by guests including post-doctoral LPS students. This course is restricted to students in the Law, Policy, and Society Program who have completed all other core courses.

Mathematics

MTH 3020 Basics of Analysis **2 Q.H.**

Topology of metric spaces; Riemann integration; sequences and series of functions. (Coincides with undergraduate MTH 1312.) *Prereq.: MTH 1311 or equivalent.*

MTH 3101 Analysis I (Real Analysis) **4 Q.H.**

Real analysis: integration, differentiation, measure theory. *Prereq.: MTH 3020 or equivalent.*

MTH 3102 Algebra I **4 Q.H.**

Vector spaces, linear transformations and dimension. Eigenvectors, eigenvalues, and Jordan normal form. Determinants. Orthogonal and Hermitian matrices. The material would be developed in conjunction with, and supplemented by, applications selected from the following areas (or others chosen by the instructor). Finite element method in PDE's and mechanical engineering. Markov processes and generalizations from operations research. Control theory.

MTH 3103 Analysis II (Complex Analysis) **4 Q.H.**

Complex function theory: holomorphic and meromorphic functions, calculus of residues, conformal mappings. *Prereq.: MTH 3020 or equivalent.*

MTH 3104 Algebra II (Groups & Rings) **4 Q.H.**

Elementary Group Theory: definitions, computation in the symmetric group, finite groups, abelian groups, special groups. Elementary Ring Theory: definitions,

integral domains, prime and maximal ideals, modules. Unique factorization. Representation of groups (group ring, characters). Applications: Fast Fourier transforms, coding theory, etc.

MTH 3105 Topology I **4 Q.H.**

First part: elements of point set topology, including general topological spaces, compactness and connectedness, products and quotients. Second part: elements of algebraic topology, including homotopy, fundamental group and homology theory. (Balance of the two parts may vary with instructor.)

MTH 3106 Analysis III (Functional Analysis) **4 Q.H.**

Topological linear spaces, normed and Banach spaces, linear functionals, weak topology, linear operators, Hilbert spaces. *Prereq.: MTH 3101.*

MTH 3107 Topology II **4 Q.H.**

A continuation of MTH 3105. Homology, cohomology, duality on manifolds. Advanced topics in algebraic/differential topology as time permits.

MTH 3222 Applied Statistics **4 Q.H.**

Level to measurement, central tendency, dispersion, relatedness and significance to differences, analysis of data through correlation, regression, F-test, Chi square tests, T-test, analysis of variance and analysis of covariance. These analyses are accomplished

using computer-based statistical subroutine packages. *Not for math graduate credit.*

MTH 3224 Biostatistics 3 Q.H.

An introduction to the use of statistical techniques as applied to problems in the life sciences. Topics will include measures of central tendency and deviation, probability distributions, estimation and hypothesis testing, correlation and regression analysis and analysis of variance. Use of a computer statistical package such as Minitab. *Not for math graduate credit.*

MTH 3230 Introduction to Computer Programming and Applications 2 Q.H.

This course is designed to introduce graduate students in sciences, social sciences, and humanities to computer programming and to the role of the computer in solving problems in their areas of study. Students will learn to write and run programs in the language BASIC, and to use the computer for software packages related to various fields of endeavor. *This course cannot be taken for credit by graduate students in the Mathematics Department.*

MTH 3231 Introduction to Computer Programming and Applications 4 Q.H.

This course is intended for graduate students in sciences, social sciences, and humanities who need to understand how computers can help solve problems in their fields of study. After instruction in the basics of computer programming and algorithm development, students are introduced to examples of the computers used in different areas of human endeavor. Students are required to write programs in BASIC programming language and run them on a computer. *This course cannot be taken for credit by graduate students in the Mathematics Department.*

MTH 3234 PASCAL 3 Q.H.

An introduction to PASCAL, emphasizing writing structured programs using loops, decision statements, procedures and functions. Data type will include integer, real, char, boolean and one- and two-dimensional arrays. *Not for math graduate credit.*

MTH 3302 Constructive Algebra 4 Q.H.

A constructive development of some of the old familiar areas of algebra: principal ideal domains, Dedekind domains, factorial domains, Noetherian rings.

MTH 3303 Set Theory 4 Q.H.

First part: Informal study of sets, including detailed discussion of the axiom of choice, well ordered sets, and transfinite arithmetic. Second part: versions of axiomatic set theory. The consistency of the continuum hypothesis and the axiom of choice. As time permits, the independence of the continuum hypothesis and the axiom of choice.

MTH 3305, MTH 3306 Philosophy of Science and Mathematics I, II 4 Q.H. each

Topics may vary from year to year. Past subjects have included the foundations of statistical inference, the structure of scientific theories, and analysis of the conceptual structure of mathematics.

MTH 3307 Constructive Mathematics I 4 Q.H.

On the constructivist conception of mathematics, all the statements are interpreted as being about computation and computational schemes. In this course, the constructivist interpretation of mathematical language is presented in detail, and some significant portion of mathematics is developed according to that interpretation.

MTH 3308 Constructive Mathematics II 4 Q.H.

A continuation of Constructive Mathematics I. Presentation of portions of analysis, algebra and geometry according to a constructivist interpretation of mathematical language, and a comparison with the traditional "nonconstructive" versions. Discussion of high level programming languages designed to be working environments for mathematics. Foundational questions.

MTH 3311 Mathematical Logic 4 Q.H.

Propositional calculus and quantificational logic; first order theories and their models; formal arithmetic and Gödel's First and Second Incompleteness Theorems.

MTH 3321 Algebra III (Fields) 4 Q.H.

Finite extensions of fields, automorphisms, structure of finite fields, normal and separable extensions, Galois group, Fundamental Theorem of Galois Theory, cyclotomic fields, solvability of equations by radicals. Applications (e.g. coding theory).

MTH 3331 Homological Algebra 4 Q.H.

Basic properties of categories and functors; sums, products, morphisms; Hom, Tensor product, and their derived functors Ext and Tor; exact sequences, homology and co-homology; homological dimension and co-dimension; applications to algebra and topology.

MTH 3332 Commutative Algebra 4 Q.H.

Prime ideals, localization, integral extensions; primary decomposition; Krull dimension; chain conditions, Noetherian and Artinian modules: additional topics from ring and module theory as time permits.

MTH 3341 Applied Mathematics I 4 Q.H.

Deterministic models in the physical and life sciences. Regular and singular perturbation: dimensional analysis; linear and nonlinear boundary layer problems; WKB theory; multiple scale analysis; qualitative analysis in phase science; singular perturbation of PDEs, asymptotic analysis.

MTH 3342 Applied Mathematics II 4 Q.H.

Introduction to dynamical systems, linear and nonlinear flows, closed orbits, asymptotic behavior and stability. *Prereq.: MTH 3020 or equivalent and undergraduate differential equations.*

MTH 3351 Ordinary Differential Equations I 4 Q.H.

Existence and uniqueness of solutions, linear differential equations, nonlinear systems (stability, perturbations of periodic solutions, Poincaré-Bendixson). *Prereq.: Undergraduate differential equations.*

MTH 3353 Partial Differential Equations I 4 Q.H.

First-order quasilinear and general nonlinear equations: method of characteristics; second-order hyperbolic, elliptic, and parabolic equations: separation of variables, potential theory, and Fourier transform. *Prereq.: Undergraduate differential equations.*

MTH 3361 Numerical Analysis I 4 Q.H.

A rapid survey of the problems, issues, and techniques of numerical analysis. Problems considered include root finding, curve fitting, numerical integration, large linear systems of equations, ordinary differential equations. Issues considered include trade-offs, such as cost vs. precision and speed vs. space. Some programming will be done. *Prereq.: FORTRAN or PASCAL.*

MTH 3362 Numerical Analysis II 4 Q.H.

The numerical solution of partial differential equations, with emphasis on elliptic equations and the finite element method. *Prereq.: MTH 3361 or its equivalent.*

MTH 3371 Optimal Control Theory I 4 Q.H.

Linear and nonlinear control problems defined by ordinary differential equations, relaxed controls, existence theorems, Pontryagin's maximum principle.

MTH 3373 Optimization 4 Q.H.

Convex sets, linear and nonlinear programming, zero-sum games, dynamic programming, iterated methods.

MTH 3386 Lie Theory 4 Q.H.

Lie groups and Lie algebras. The exponential map. Examples, basic structure theorems. Representation theory. Applications. Additional topics vary with the instructor and may include infinite-dimensional Lie algebras, algebraic groups, finite groups of Lie type, geometry and analysis of homogenous spaces.

MTH 3400 Foundations of Geometry 4 Q.H.

Topics are: (1) Spaces on which geometry is done: Euclidean space, Riemann surfaces, differentiable manifolds, algebraic varieties. (2) Maps between manifolds: inverse and implicit Function theorems, Sard's theorem, transversality, singularities. (3) Invariants of manifolds and maps: degree and index. (4) Morse Theory: the relationship between manifolds and their differentiable functions. Application: classification of surfaces using Morse Theory. *Prereq.: Advanced calculus.*

MTH 3411 Differential Geometry 4 Q.H.

Geometry of surfaces in the euclidean space, with emphasis on the global aspects, using the technique of tensor calculus. Elements of Riemannian geometry, connections. Holonomy.

MTH 3414 Geometry and Mechanics 4 Q.H.

Hamiltonian and Lagrangian systems. Manifolds, differential forms, tensors and connections. Global structure of variational problems in higher dimensions.

MTH 3415 The Inverse Scattering Transform 4 Q.H.

The Schrödinger spectral problem on the line. Nonlinear evolution equations solvable by the inverse scattering transform. Solitons. Bäcklund transformations.

MTH 3431 Probability I 4 Q.H.

Introduction to probability; independent random variables; types of convergence; laws of large numbers; characteristic functions, central limit theorem.

MTH 3432 Probability II 4 Q.H.

Introduction to stochastic processes; random walk; conditional expectations; Markov processes; multivariate normal distribution; Brownian motion.

MTH 3441 Statistics I 4 Q.H.

Parametric families of distributions; testing hypotheses; likelihood ratio tests; estimation and maximum likelihood, regression.

MTH 3443 Statistical Decision Theory 4 Q.H.

Subjective probability, utility. Bayesian approach to decision problems, including estimation, testing hypotheses, and linear statistical models. Sequential decisions. Admissibility.

MTH 3444 Analysis of Variance 4 Q.H.

One-sample and two-sample tests; one-way ANOVA; factorial and nested designs; Cochran's theorem; regression; analysis of covariance; simultaneous confidence intervals.

MTH 3445 Topics in Statistics 4 Q.H.

Topics to be selected from multivariate statistics and clustering; biostatistics; Stein's paradox and admissibility, foundations; probabilistic and inferential aspects of reliability theory.

MTH 3448 Nonparametric Methods in Statistics 4 Q.H.

This course presents methods for analyzing the data which is not necessarily normal. Topics emphasized include: comparing two treatments (the Wilcoxon test, Kolmogorov-Smirnov test), comparison of several treatments (the Kruskal-Wallis test), randomized complete blocks, tests of randomness and independence, asymptotic methods (the δ method, Pitman efficiency).

MTH 3450 Categorical Data Analysis 4 Q.H.

This course is primarily concerned with the analysis of data in tables, that is, with cross-classified data. Topics will include loglinear models (a generalization of analysis of variance methods) and logistic regression. Homework problems will sometimes involve the analysis of real data and will sometimes focus on theoretical issues.

MTH 3460 Pattern Recognition 4 Q.H.

An introduction to the methods of pattern recognition: multivariate normal distribution, linear discriminant analysis, logistic regression, tree structured classification, cluster analysis, jackknifing and bootstrapping, cross-validation.

(This course is intended for students interested in computer science or applied statistics.)

MTH 3501 Data Structures 4 Q.H.
Basic structure for representing and manipulating data in computer programming: arrays, lists, stacks, queues, dequeues, trees, binary trees. Applications to nonnumeric computations. Searching and sorting. Students are required to write programs to implement these structures on a computer.

MTH 3502 Computer Organization and Assembly Programming 4 Q.H.
Computer organization; hardware and software components. Memory organization and addressing. Machine representation of data. Machine language and assembly programming. Subroutines and macros. Students are required to program several short exercises in assembly language and to undertake a term project at the end of the course.

MTH 3503 Compilers 4 Q.H.
Study of compilers; finite automata and lexical analysis; syntax specification; parsing; syntax-directed translation, symbol tables; run-time storage administration; error detection and recovery; code optimization, code generation. Students work as a team on a large programming project. *Prereq.: knowledge of assembly language programming and some knowledge of data structures.*

MTH 3514 Efficient Algorithms 4 Q.H.
We will discuss some of the recently discovered algorithms for evaluation of polynomials, string matching, generation of primes, roots of polynomials over finite fields, hash coding and finite Fourier transform and its applications. *Prereq.: MTH 3535.*

MTH 3521 Theory of Automata and Formal Language 4 Q.H.
Finite-state machines and regular expressions, context-free grammars. Parsing of context-free languages. Context-sensitive grammars, push-down stores, stock machines, and linear-bounded automata. Turing machines, undecidability, description of computation using list-structures, program machines, and programs.

MTH 3522 Artificial Intelligence 4 Q.H.
Analysis of current computer programs dealing with problems such as theorem proving, chess playing, general problem solvers, robotics, symbolic computation, perceptions, self-reproducing automata, and parallel machines. *Prereq.: A course in data structures.*

MTH 3524 Discrete Mathematical Models 4 Q.H.
The course introduces the notion of mathematical model, develops mathematical models relevant to problems in psychology, sociology, environmental science, political science, etc. The emphasis is on the use of discrete mathematical tools such as graph theory, Markov chains, game theory, etc.

MTH 3527 Combinatorics I (Enumeration) 4 Q.H.
Various techniques of enumerative combinatorics, including binomial and multinomial theorems, principle of inclusion-exclusion, recurrence relation, generating functions. Stirling numbers. Special topics such as distributions, partitions, and polycounting theory are also covered. Topics in Matching Theory, including Hall's theorem. Marriage Problem and Rado's Selection Principle.

MTH 3528 Combinatorics II (Coding Theory & Block Designs) 4 Q.H.
Block designs, including t-designs, orthogonal Latin Squares, difference sets and finite geometries. Algebraic coding, including cyclic codes, Reed-Solomon Codes, BCH Codes, and Reed-Muller codes. *Prereq.: MTH 3102.*

MTH 3529 Graph Theory 4 Q.H.
Graphs and subgraphs; trees; connectivity; Euler tours and Hamilton cycles; matchings, edge colorings; independent sets and cliques; vertex colorings; planar graphs; directed graphs; networks, the cycle space and bond space.

MTH 3530 Topics in Combinatorics 4 Q.H.
Topics in combinatorics will be offered in a different subspecialty each time. Topics will be chosen from: game theory, combinatorial geometry, measurement, algebraic combinatorics, etc.

MTH 3535 Algorithms and Complexity Theory 4 Q.H.
Complexity of algorithms, kinds of complexity; intractable problems, including NP-complete and NP-hard problems; approximation algorithms and local search; parallel processing and randomized algorithms.

MTH 3806 Readings in Algebra 4 Q.H. per quarter

MTH 3807 Seminar in Algebra 4 Q.H. per quarter

MTH 3811 Readings in Analysis 4 Q.H. per quarter

MTH 3812 Seminar in Analysis 4 Q.H. per quarter

MTH 3818 Seminar: Dynamical Systems 4 Q.H. per quarter

MTH 3821 Readings in Topology 4 Q.H. per quarter

MTH 3822 Seminar in Topology 4 Q.H. per quarter

MTH 3826 Readings in Statistics and Probability 4 Q.H. per quarter

MTH 3827 Seminar in Statistics 4 Q.H. per quarter

MTH 3836 Seminar in Combinatorics**4 Q.H. per quarter**

The department offers an assortment of courses under the general heading "Seminar" (MTH 3812-9). At the outset of each quarter, times for organizational meetings will be posted. Schedule and content are negotiated at these meetings. Students and faculty

with interest in the specialty of the seminar are encouraged to attend the organizational meeting.

MTH 3850 Doctoral Dissertation

Students may take graduate courses in the Computer Science College as required electives with permission of their adviser.

Physics

I. Introductory Courses

PHY 1432 Thermodynamics and Kinetic Theory **3 Q.H.**

Topics include first and second laws of thermodynamics; entropy and equilibrium; thermodynamic potentials; elementary kinetic theory; statistical mechanics and the statistical interpretation of entropy.

PHY 1433 Introduction to Nuclear Physics **3 Q.H.**

Topics include nuclear structure; nuclear masses; radioactivity-nuclear radiation; interaction of radiation and matter; detectors; fission, nuclear forces; elementary particles. *Prereq.: PHY 1303 or equiv.*

PHY 1434 Introduction to Solid State Physics **3 Q.H.**

This course offers a semiclassical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Topics include X-ray diffraction and the reciprocal lattice; elasticity and lattice vibrations; specific heat; properties of insulators; magnetism in insulators and metals; introduction to the band theory of metals; *Prereq.: PHY 1432 and PHY 1303 or equiv.*

PHY 1435 Quantum Mechanics I **3 Q.H.**

The first of a two-quarter sequence in quantum mechanics, this course focuses on observations of macroscopic and microscopic bodies, the uncertainty principle—wave-particle duality; probability amplitudes; Schrodinger wave theory; one-dimensional problems. *Prereq.: PHY 1303 or equiv.*

PHY 1436 Quantum Mechanics II **3 Q.H.**

A continuation of PHY 1435, this course covers discrete and continuous states; Schrodinger equation in three dimensions; angular momentum; general theory of quantum mechanics; applications. *Prereq.: PHY 1435.*

PHY 3401 Radiation Physics **2 Q.H.**

Introduction to atomic and nuclear physics for graduate students in biology and pharmacy. Topics include quantum mechanics and atomic structure, nuclear structure, radioactivity, properties of nuclear radiation, detection of radiation.

PHY 3402 Radiation Biology **2 Q.H.**

The effects of radiation on biological systems and the uses of radiation in medicine and biological research. Topics selected from effects of radiation on

chemical reactions; effects of radiation on cells, organs, and individuals; theories of radiation damage and repair; imaging and tracer techniques using radiopharmaceuticals; radiation safety and standards. *Prereq.: PHY 3401 or equiv.*

PHY 3551, PHY 3552 Electronics for Scientists I, II **4 Q.H.**

PHY 3551 and PHY 3552 form a two-quarter sequence covering electronic techniques for experiments research in many different fields of science. Topics include principles of semiconductor devices; analog techniques (amplification, feedback, integration), digital techniques (counting, multiplexing, logic); design of electronic subsystems (analog-to-digital converters, phase-sensitive detectors, data-logging systems); understanding specifications of commercial electronic equipment. Lab examples make use of up-to-date integrated and discrete devices, such as are currently used in the electronic industry.

II. Elective Courses (offered every year)

PHY 3557 Graduate Advanced Laboratory **4 Q.H.**

This course presents special projects in modern experimental physics, including electronic instrumentation used in measuring physical quantities and use of microprocessors. *Prereq.: PHY 3551 and 3552 or permission of instructor.*

PHY 3561 Graduate Project Laboratory **4 Q.H.**

This course allows students to select and carry out individual projects involving instrumentation and computation. The projects involve the development of some aspect of instrumentation and/or computation in an ongoing research project, and the preparation of a final report. The student will be supervised by the project leader and the course instructor. Although the course carries 4 Q.H. credit, it is taken in successive winter and spring quarters. *Prereq.: Permission of instructor.*

III. Required Regular Courses (offered every year)

PHY 3601, PHY 3602 Mathematical Method A **4 Q.H.**

Topics from: calculus of variations. Euler-Lagrange equations. Mathematical methods in physics. Topics from theory of function of a complex variable. Analytic functions. Taylor and Laurent series. Analytic con-

tinuation and classification of functions. Calculus of residues. Asymptotic series. Dispersion relations. Applications to ordinary differential equations and the study of special functions. Finite and infinite dimensional vector spaces. Linear operators. Function spaces and generalized Fourier expansions. Green's functions and integral equations. Introduction to group theory.

PHY 3603 Classical Mechanics 4 Q.H.

Generalized coordinates and Lagrangian formulation of mechanics, conservation laws. One-dimensional and central force problems. Collision theory. Rigid bodies. Hamiltonian formulation and the canonical formalism. Continuous systems and classical fields.

PHY 3605 Computational Physics

Computer hardware; Fortran; numerical analysis; Monte Carlo methods; algebraic manipulation; display and graphics; second programming language.

PHY 3611, PHY 3612, PHY 3613 3 Q.H.

Electromagnetic Theory A, B, C

Maxwell's equations. Static field and boundary value problems, multipole expansion. Phenomenology of dielectrics, conductors, and magnetic materials. Faraday's Law. Energy and momentum; Poynting vector; Maxwell stress tensor. Plane waves, polarization. Reflection and refraction; diffraction. Relativity Radiation from sources. Motion of charged particles in electromagnetic fields; magnetic mirrors, particle accelerators. Introduction to plasma physics; magnetohydrodynamics. Radiation from accelerated charges; bremsstrahlung, synchrotron radiation. Scattering of radiation; interaction of radiation with matter. *Prereq.: PHY 1403, PHY 3601 (concurrently).*

PHY 3621, PHY 3622, PHY 3623 4 Q.H.

Quantum Theory A, B, C

Experimental basis of quantum theory. Schrodinger equation and probability interpretation of wave mechanics. Uncertainty principle. Application to one-dimensional problems, the harmonic oscillator, orbital angular momentum, and the central force problem. Quantum theory of scattering. Born approximation. Phase-shift analysis, introduction to S-matrix theory. General formulation of quantum mechanics in Hilbert space. Spin. Identical particles and symmetrization principle. Time-independent and time-dependent perturbation theory. Semiclassical theory of radiation and atomic spectra. Addition of angular momentum. Wigner-Eckart theorem. Quantum theory of radiation. Absorption, emission, and scattering of photons. *Prereq.: PHY 1435 or equiv.*

PHY 3624 Advanced Quantum Theory 4 Q.H.

Introduction to the formulation of a relativistic quantum theory. Study of the Dirac equation and its Lorentz covariance. Plane-wave solution of the Dirac equation, and projection operators. Bound-state solutions of the Dirac equation in a Coulomb field and the hydrogen atom. Parity, charge conjugation, and time-reversal symmetries. Propagator theory. *Prereq.: PHY 3623.*

PHY 3631 Statistical Physics A 3 Q.H.

The phenomenological theory of thermodynamics. Fundamental relations and thermodynamic potentials. Extremal principles of thermodynamics. Applications to simple systems. Stability conditions. Phase transitions. Thermodynamics of electric and magnetic systems. Principles of irreversible thermodynamics. *Prereq.: PHY 3603 and PHY 3621 (concurrently).*

PHY 3632, PHY 3633 Statistical Physics B, C 3 Q.H.

The principles of statistical mechanics and statistical thermodynamics. Density matrix. Theory of ensembles. Derivation of the laws of thermodynamics. Fermi-Dirac and Bose-Einstein statistics. Application to gases, liquids, and solids. Theory of phase transitions. Second-quantization formalism for interacting systems. Cooperative phenomena. *Prereq.: PHY 3631, PHY 3621.*

PHY 3641, PHY 3642 Solid State Physics 4 Q.H.

The course covers topics from Drude and Sommerfeld (or free electron) models of electrons in metals, crystal structure, one-electron states in crystal lattices, Bloch's Theorem, semiconductors and semiconducting devices, effects of electron-electron interactions, lattice vibrations and the classical and quantum theories of specific heat, optical properties of solids, investigation of crystal structure and excited states of crystals by X-ray and neutron scattering, simple transport theory based on the Boltzmann equation, magnetic properties of solids.

PHY 3651, PHY 3652 Particle and Nuclear Physics A, B 4 Q.H.

Topics are chosen from nuclear models, nuclear scattering and reactions; classification of particle interactions, internal symmetries, field theory, unification of weak and electromagnetic interactions; gauge theories. *Prereq.: PHY 3624.*

IV. Advanced Electives

PHY 3643, PHY 3644, PHY 3645 4 Q.H.

Advanced Solid State Physics A, B, C

Selected advanced topics in the theory of solids to be chosen each time by the interested students and instructor. For example, theory of normal metals, Hartree-Fock and Random phase approximations, optical and transport properties, solid-state plasmas, Raman spectroscopy, quasiparticles and collective excitations, quantum solids, amorphous solids. *Prereq.: PHY 3633, PHY 3623, PHY 3642.*

PHY 3653, PHY 3654, PHY 3655 Fields, Particles, and Currents A, B, C 4 Q.H.

Introduction to a local field theory. Symmetries of the Lagrangian and conservation laws. Lorentz group, spin and helicity. P, C, and T. Klein-Gordon, Dirac, vector meson, photon and non-Abelian gauge fields. Gauge theories; Feynman path integral formulation. The S-matrix and LSZ reduction formulae. Spectral representations. Feynman diagrams. Green's func-

tions at large Euclidean momenta. Renormalization and finiteness. Quantum chromodynamics. The renormalization group and asymptotic freedom. Spontaneous breaking and Higgs phenomenon. Glashow-Salam-Weinberg unified theory of weak and electromagnetic interactions. *Prereq.: PHY 3624*

PHY 3661, PHY 3662, PHY 3663 **4 Q.H.**
Many-Body Theory A, B, C **4 Q.H.**

Introduction to some many-body problems and the required mathematical techniques. Theory of linear response and correlation functions. Landau's theory of Fermi liquids and applications to solids. Theory of superconductivity and superfluidity. General theory of Green's functions and diagrammatic techniques. *Prereq.: PHY 3633, PHY 3623, PHY 3642.*

PHY 3671 Foundations of General **4 Q.H.**
Relativity

The course discusses the physical basis underlying relativity (the weak and strong principle of equivalence), the role of the metric tensor as a carrier of gravitational information, and the modification of the Lorentz covariant field equations in the presence of gravitation. An introduction to Riemannian geometry is given, and the Einstein field equations and tests of Einstein's theory are discussed. *Prereq.: PHY 3672, PHY 3603, PHY 3613, and PHY 3623.*

PHY 3672 Relativistic Astrophysics and **4 Q.H.**
Cosmology

The course deals with the equations for the relativistic stellar system, white dwarfs, neutron stars and properties of pulsars, gravitational collapse and black holes, quantum radiation from black holes, super heavy stars as possible quasar energy sources, quantum effect in gravitational collapse, the metric for cosmological systems, and the big bang theory. *Prereq.: PHY 3671 and PHY 3624.*

PHY 3673 Quantum Gravity **4 Q.H.**

The course deals with gravitation as a quantum field, threshold properties of gravitational quantum S-matrix, quantization leading to a set of Feynman rules, calculations of simple tree diagrams, closed loop infinities and the problem of renormalizability of quantum gravity. *Prereq.: PHY 3672*

PHY 3798 Master's Thesis Continuation **0 Q.H.**

PHY 3799 Doctoral Dissertation **0 Q.H.**
Continuation

PHY 3811, PHY 3812, PHY 3813 Reading **1 Q.H.**
Course

PHY 3821, PHY 3822, PHY 3823 Reading **2 Q.H.**
Course

PHY 3831, PHY 3832, PHY 3833 Reading **3 Q.H.**
Course

PHY 3841, PHY 3842, PHY 3843 **4 Q.H.**

Reading course, or theoretical or experimental work under individual faculty supervision. *Prereq.: Consent of faculty member.*

PHY 3890 Master's Thesis I **4 Q.H.**

Student will start a Master's thesis in a selected topic in experimental or theoretical physics. *Prereq.: Consent of faculty member.*

PHY 3891 Master's Thesis II **4 Q.H.**

Continuation and completion of Master's thesis. Written thesis is required. *Prereq.: At least a B grade in PHY 3890 and consent of faculty member.*

PHY 3895 Doctoral Dissertation

Experimental and theoretical work for Ph.D. candidates.

Political Science

All courses carry three quarter-hours of credit unless otherwise specified. Most courses are seminars.

ECN 3111 Economics for Public Administrators

Introduction to basic economic concepts essential to other courses in the program. This course is a prerequisite for students lacking economic course work at the baccalaureate level.

ECN 3111 Economics for Public Administrators

Introduction to basic economic concepts essential to other courses in the program. This course is a prerequisite for students lacking economic course work at the baccalaureate level.

POL 3500 Scope and Methods of Political Science

This course is designed as an in-depth examination of the assumptions, principles, etc., that underlie contemporary political science. As such, it invites the student to consider the present practice of the disci-

pline in the light of its history and to critically evaluate the discipline in the interest of a greater understanding of nature and limits.

POL 3502 Seminar in American Government

This course analyzes the institutions of the national government in the United States, focusing on the executive, legislative, and judicial branches. Political parties and pressure groups are also examined, as is the American constitutional system. *M.P.A. elective.*

POL 3504 Political Psychology and Socialization

An examination of theories of political psychology, opinion formation, and attitude change; of political ideology; of processes of individual political development and socialization; of effects on mass and elite political behavior; of attitudinal differences and

differential socialization experiences; of individual political behavior and the political system.

POL 3506 Politics and the Mass Media

Study of the role of mass media in the formation of public opinion, with special attention given to media usage in the electoral process.

POL 3508 American Legislative Process

Study of Congress and of the influence of the President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy. *M.P.A. elective.*

POL 3510 Theories of American Political Participation

This course focuses on political behavior at both the national electorate level and at the level of legislative roll-call voting, analyzing the relative impact of demographic and attitudinal components as well as the effect of constituency and partisan identification upon legislative behavior.

POL 3512 American Constitutional Law I

Employing excerpts of U.S. Supreme Court decisions and other primary legal materials, this course examines the constitutional rationale for judicial review; various philosophical approaches to the exercise of judicial power; and the scope of judicial authority to settle questions challenging the legitimacy of governmental actions in the American constitutional system.

POL 3514 American Constitutional Law II

Using excerpts of primary legal materials, this course builds upon the judicial doctrines developed in POL 3512 and specifically examines the constitutional theories behind the growth of congressional prerogatives in economic and social affairs and expanding presidential power in internal and foreign matters. *Prereq.: POL 3512 or consent of the instructor.*

POL 3516 The Presidency

An analytic treatment of the constitutional and extraconstitutional powers of the contemporary president, an examination of the place and function of the chief executive in the formulation and execution of public policy. *M.P.A. elective.*

POL 3518 American Electoral Behavior

The theoretical and methodological assumptions of election studies of the American political system are analyzed and the substantive conclusions carefully reviewed.

POL 3519 Campaigns and Elections

A study of campaign tactics and strategies. *Field Work required.*

POL 3520 The Judiciary

Analysis of the role of the judiciary in the American governmental process. Special attention is given to those areas of constitutional law in which the courts' decisions have a profound impact on the basic structure of American politics (apportionment, economic regulation, federalism, etc.).

POL 3522 Political Parties, Pressure Groups, and Public Policy

A study of the role of parties and pressure groups in the policy-making process, trends in contemporary party politics are examined as well as behavior patterns of the American electorate.

POL 3524 Civil Rights

Examination of the doctrine of constitutionalism, illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of federal courts, and congressional enactments.

POL 3526 Procedural Due Process

Utilizing excerpts from U.S. Supreme Court decisions and other legal materials, this course examines the philosophical and constitutional relationships between Amendments 4, 5, 6, and 8 and the Fourteenth Amendment. The substance of the right to fair trial, counsel, confrontation, protection against self-incrimination, and unreasonable searches and seizures are among the many procedural rights examined through the decisions of the Roosevelt, Vinson, Warren, and Burger Courts.

POL 3531 Models of Political Systems

A detailed examination and critique of current models of political systems.

POL 3533 Eurocommunism

A study of the ideology and political behavior of the communist parties of Italy, France, and Spain, with emphasis on their independence of, and challenges to, the domestic and foreign policies of the Soviet Communist Party.

POL 3535 Parliamentary Democracy in Western Europe

A comparative analysis of environment, vehicles of popular participation, and formal structures and reach of government in the parliamentary democracies of western Europe. Special attention is given to England, France, and Germany.

POL 3537 Comparative Communism

A comparative analysis of environment, vehicles of popular participation, and formal structures and reach of government in the Soviet Union, the socialist countries of eastern Europe, and China.

POL 3539 European Political Parties

A comparative cross-national study of political organization and behavior in England, France, and Germany with emphasis on party leadership, strategy, organization, and constituency as well as socialization, recruitment, and participation of voters.

POL 3541 European Legislative Systems

A comparative analysis of the legislatures in Britain, France, and Germany with emphasis on patterns of historical development, functions, internal organizations, and relations with the executive.

POL 3543 European National Executives

A comparative cross-national study of executive decision making in England, France, and Germany with emphasis on varying patterns of presidential and cabinet authority as well as relationships with the legislature.

POL 3545 Government and Politics in the Middle East

This course examines the political and economic structures of the Arab states and Israel as well as inter-Arab politics and inter-state conflict in the area.

POL 3547 Government and Politics of North Africa and the Middle East

Comparative analysis of the political systems and foreign policies of African states north of the Sahara. Also stressed is the relationship of this area with the Middle East.

POL 3550 Government and Politics of the United Kingdom of Great Britain and Northern Ireland

An analysis of government organization and political behavior in the United Kingdom. Special attention is given to executive-legislative relations, the political party system, and the politics of Northern Ireland.

POL 3551 Seminar in International Relations

An in-depth analysis of the major actors, their goals, and the means and strategies they utilize within the international system.

POL 3552 International Political Economy

The course explores new directions in the field of international political economy. Stress is laid on approaches to and trends within the field, such as 1) the intellectual and theoretical roots of international political economy; 2) the management of collective goods; 3) relations between advanced industrial states; 4) relations between advanced industrial and less industrial states; 5) relations between nonstate and state actors.

POL 3553 Government and Politics in Germany

A study of political culture, federalism, and executive-legislative relations on the national level with a view to appraising the quality and durability of the present democratic system.

POL 3554 Government and Politics of France

A study of current governmental organization and political behavior in France. Special attention is given to the role of the presidency, executive-legislative relations, and the political party system.

POL 3555 International Organization

This course focuses on issues of international political economy. The role of various international organizations in managing economic interdependence is emphasized. Attention is given also to the role of international administrators in the UN's search for a new international economic order. Discussion of nongovernmental organizations, such as multinational corporations, is included.

POL 3556 China in Revolution

Addresses the problems faced by a revolutionary China in forming new attitudes, instituting a revolutionary political culture, and reconstructing and developing a country on the basis of a revolutionary ideology. Illustration of the manner in which the party, state, military, education, health, science, and medicine have been modified since 1949 to ensure the continuation of a revolutionary polity.

POL 3557 Soviet-Chinese Relations

A chronological and topical analysis of the Soviet-Chinese relationship since 1950 with special attention to the causes of rivalry and conflict in the 1960s and 1970s.

POL 3558 Asia and the Politics of Development

This course relates the theoretical literature on political development to the concrete attempts to develop in Asia. Because of the diversity in levels and types of political development in Asian states, each student is encouraged to concentrate on one state and explore different ideas about political development as they relate to that state.

POL 3559 Governments and Politics of Latin America

This course investigates contemporary Latin American politics with particular emphasis on revolution, development strategies, and social change. Focus is on three representative nations such as Mexico, Chile, and Cuba.

POL 3560 Politics of the Developing Nations

The process of political development in the Third World, including both internal and international issues such as leadership patterns, the role of the military and political parties, and underlying economic and social factors.

POL 3561 Great Powers and the Middle East

An analysis of the changing nature of great power and multinational involvement in the Middle East.

POL 3562 United States-Soviet Relations

The relations between the United States and the Soviet Union from 1917 to the present. Topics stressed are the "nonrecognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the present power conflict.

POL 3563 United States-Far Eastern Relations

American diplomacy in the Far East, with primary concentration on relations with Japan since World War II, with China, and with Southeast Asia.

POL 3564 China's Foreign Policy

A study of the Chinese government's relations with the Third World socialist states and the West and its behavior in the United Nations. Analyzes changing policies toward international law, trade, tourism, scholarly exchange, and foreign ventures in China. Attention is given to policy objectives strategy, tactics, and the method of decision making in the foreign policy apparatus.

POL 3565 Soviet Relations with Eastern Europe

An analysis of Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop communism and maintain a position of preeminence in this region.

POL 3566 Chinese Politics

Concentrates on the objectives of the Chinese revolution from 1911 to the present. Examines the political theory and institutions which have been established to promote "permanent revolution" and evaluates the nationality of Chinese communist policies in terms of Chinese goals. Concentrates on the changes made in domestic, economic, legal, and political policies since 1976.

POL 3567 Japanese Politics

Designed for students in both comparative politics and in international relations, the course examines the unique Japanese electoral system, political processes and organizations, political culture and socialization, the role of business in politics, and Japanese foreign policy.

POL 3568 Sub-Saharan African Politics

Comparative analysis of the political systems and foreign policies of selected African states south of the Sahara. Special attention is given to the Republic of South Africa and its policy of apartheid.

POL 3569 Decision Making in U.S. Foreign Policy

Comprehensive analysis of the governmental mechanism and process for decision making in U.S. foreign policy. Case studies in decision making are emphasized.

POL 3570 American Foreign Policy

Examination in depth of selected issues concerning the role of the United States in world affairs since 1945.

POL 3572 Problems of World Order I

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

POL 3573 Problems of World Order II

Political problems of world order are stressed. Representative topics include arms control and disarmament, the limits of economic growth, international political economy, population problems, and resource distribution.

POL 3574 American National Security Policy

This course deals with United States national security policy in the post-World War II era. The focus is on the evolution of U.S. nuclear and conventional strategy and arms control efforts. Future military and arms control options will also be considered.

POL 3575 Arab-Israeli Dispute

The Arab-Israeli confrontation has its own dynamics and a character that has changed through the decades. This course analyzes its interaction with the

internal politics of the Arab states and Israel, pan-arab politics, and the role of the great powers in the region.

POL 3578 Soviet Foreign Policy

A study of Soviet foreign policy since 1964. Among the topics discussed are detente in relations with the United States; polycentrism in East Europe; involvements and commitments in the Middle East and Africa; and the dispute with China.

POL 3580 The United Nations

Selected topics on the nonpolitical work of the United Nations: human rights; economic, social, health and related problems; decolonization and the trusteeship system.

POL 3581 International Peacekeeping

A detailed investigation of the origins, history, and theory of interventionary peacekeeping, with reference to the documentation of the United Nations. An assessment of this method of maintaining regional stability and a projection of potential means of developing the method to broader applicability.

POL 3583 International Law

Examination of selected topics in international law not covered in POL 3572 and POL 3573.

POL 3584 Regional Organizations

Regional organizations, such as EEC or OAU, are studied to determine the capability of such organizations to promote economic development and political influence.

POL 3585 The Atlantic Community

A topical analysis of European-American diplomacy with particular stress upon security and economic matters. Major consideration of the integration of Europe, American responses, and the results of these interactions for world political and economic stability.

POL 3586 Nationalism

The evolution and role of nationalism in both theory and practice. Representative nationalistic movements and theories are analyzed.

POL 3587 Politics of Revolution and Change

Analysis of the nature of political change with attention to both theory and practice. Topics discussed are revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

POL 3589 Terrorism, Violence and Politics

Analysis of the theory and practice of terror, violence, coercion, force, and threats in political life.

POL 3590 Crisis Politics In Democracies and Dictatorships

Analysis of governmental response to crises and emergencies. Consideration of such topics as war powers, riot and rebellions, martial law, transfer of regime, succession problems, economic crises, presidential emergency powers, national security powers, executive privilege, and impeachment.

POL 3591 Totalitarianism

An analysis of totalitarianism and dictatorship, including study of historical background, fundamental characteristics; theories of origin, nature, and significance; and evaluation of techniques, ideologies, policies, and instruments of power. Special attention is given to the government and politics of the Soviet Union.

POL 3593 Ancient and Medieval Political Thought

The development of political thought from Greek antiquity to the end of the Middle Ages, utilizing both historical and analytical approaches. Attention is also paid to the cultural, social, and intellectual context within which political theories develop.

POL 3594 Modern Political Thought

Examination of political thought from Machiavelli to Marx.

POL 3595 Contemporary Political Theory

The main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory philosophy and political science.

POL 3596 Marxism

Examination of the theory and practice of Marxism, including its background and origins, and its subsequent development.

POL 3597 Trends in American Political Thought

Examination of intellectual concepts and movements that have informed and influenced American political life, with emphasis upon those relating to the making and execution of public policy. *M.P.A. elective.*

POL 3600 Survey of Public Administration

Introduction to the literature and the major topics in public administration with special attention given to the interrelationships of politics and administration. *M.P.A. core course.*

POL 3601 Public Personnel Administration

Technique, practice, and organization of personnel functions in public administration, including recruitment, compensation, training, discipline, and relations with employee organizations. *M.P.A. core course.*

POL 3602 Organization Theory and Management

An in-depth study of the major organization theories, including the scientific basis for organization theory; models and ideal types; decision making; application of game theory, systems analysis. *M.P.A. core course.*

POL 3603 Public Finance and Budgeting

Emphasizes the public budgeting function in its relationship to other functions of public administration. The subject is approached from a management perspective, and conflicting legislative and executive finance and budgeting interests are examined. Also included is an illustration of the budget cycle and an examination of the mechanics of budget preparation. Attention is given to means for improving budget

decision making and administration through quantitative and other methods. *M.P.A. core course.*

POL 3604 Techniques of Policy Analysis

This course is an intensive introduction to the study of public policy analysis. Its goal is to provide students with a systematic approach for understanding the origins, formulation, implementation, and impacts of government "outputs." Following a review of key analytic concepts and alternative theoretical perspectives, the political dimensions of public policymaking as well as the technical aspects of program design and evaluation will be considered within the general framework of the "natural history" of the policymaking process. Lectures and class discussion will make use of case materials drawn from a broad spectrum of contemporary substantive policy areas. *M.P.A. core course.*

POL 3605 Quantitative Techniques for Public Administrators I

A consideration of the theory and process of administrative study including philosophy of science, quantitative and qualitative designs and methods of problem solving, and drawing causal principles. *M.P.A. core course.*

POL 3606 Quantitative Techniques for Public Administrators II

This is an intermediate course in quantitative methods with an emphasis on techniques and practical applications of value to administrators and analysts in the public sector. The primary topics to be covered include significance testing, bivariate regression correlation, and multiple regression and multiple correlation. The students will also be taught how to generate and interpret statistical analyses through use of the SPSS "packaged" program. *M.P.A. core course.*

POL 3607 Quantitative Techniques III: Computer Applications

This course will provide basic knowledge of computer usage for public administration, policy analysis, and social research generally. The goal is for all students to develop sufficient familiarity with computer systems so that they can write their own programs (using a "packaged" statistical programming language), create files to store their programs and data, modify these files as necessary, generate "output" through the proper execution of these programs, and interpret the results. Students will also be introduced to the purposes and uses of the personal computer. *M.P.A. core course.*

POL 3610 Methods of Economic Analysis for Public Administrators

A central concern of this course is to introduce a construct of public economy as a means for focusing on contemporary issues facing public administrators. Both the concepts and applications of economic analysis are presented to offer the student a new analytical tool for evaluating public policy,

implementation, and impacts on the citizenry. *M.P.A. elective.*

POL 3611 Intergovernmental Relations

An institutional-behavioral analysis of the changing relationship among the various levels of American government—national, state, and local—relating the pattern of change to the social and economic forces which underlie it. *M.P.A. elective.*

POL 3613 Constitutional Law in Public Administration

An introduction to American constitutional law and the federal system using case materials and emphasizing principles of importance to public administrators, including such constitutional concepts as separation of powers, judicial review, dual federalism, legislative investigating power, executive impoundment, federal preemption, and the appointment and removal power. *M.P.A. elective.*

POL 3614 Administrative Ethics in Public Management

An analysis of ethical problems in American public administration including discussion of ethical dilemmas frequently faced by public managers. *M.P.A. elective.*

POL 3615 Development Administration

This course takes a "manager's-eye view" of the formulation, implementation, evaluation and improvement of development projects in less developed countries. Topics include integrated rural development, community participation, lower- and middle-level management decentralization and management training. *M.P.A. elective.*

POL 3616 State Government

Appraisal of the problems of contemporary state government in the United States. Particular emphasis is given to the state government of Massachusetts. Individual research is stressed. *M.P.A. elective.*

POL 3617 Industrial Policy

Industrial Policy analyzes the problems and prospects of advanced industrial economies. Focus is on the role of state government in developing a strategy to promote economic development and create jobs. *M.P.A. elective.*

POL 3618 Problems in Urban Planning

An exploration of the resources available to the urban planner for policy implementation, including zoning, subdivision regular action, and capita improvement programs. Special emphasis is given to the planning of individual sites. *M.P.A. elective.*

POL 3619 Techniques of Urban Planning

A study of the history and techniques of city planning, stressing the elements of planning. *M.P.A. elective.*

POL 3620 Politics of State and Urban Planning

An investigation of the relationships of planning to other governmental functions with stress on

practical processes, particularly at the municipal government level. *M.P.A. elective.*

POL 3621 Problems of Urban Development

An examination of the role of government and politics in the planning, programming, and administration of regional and urban development in the United States. Consideration is given to urban renewal; interurban and interregional competition; interstate compacts; public authorities; T.V.A., Appalachia, and New England regional development; antipoverty programs; and conflict between public and private interests. Individual research is stressed. *M.P.A. elective.*

POL 3622 Urban Government

The contemporary crisis in urban government—problems of political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city are stressed. Particular emphasis is given to the Boston metropolitan area. Individual research is stressed. *M.P.A. elective.*

POL 3623 Transportation Policy

Examination of the role of politics, governmental mechanisms, and public policy in the transportation planning process. Particular attention is given to political interest groups and the manner in which they affect transportation policy on the federal, state, and local levels. *M.P.A. elective.*

POL 3624 Problems of Community Development

Examination of the role of government, politics, and public policy in the urban process and related problems in the United States. *M.P.A. elective.*

POL 3625 Collective Bargaining and Labor Relations in the Public Sector.

The study of labor relations in public enterprises, with special emphasis on the role of public employee unions and collective bargaining. Main emphasis is divided between the context of labor relations in the public sector (including employee rights and legal issues) and the history, theory, techniques and impacts of public employee unionism and collective bargaining. *M.P.A. elective.*

POL 3626 Grantsmanship

This course provides students the opportunity to increase their knowledge of the federal grant system. Emphasis is placed on developing the ability to write effective grant proposals and on improving management skills.

POL 3627 Management Information Systems

Introductory course, assumes no computer background. Emphasis on microcomputer applications in spread sheets, data base management, graphics, and word processing. Survey of hardware, software, and communications needs of managers and policy-makers. *M.P.A. elective.*

POL 3629 Computers and Public Administration

A general orientation to the computer, its uses and operation, with particular attention to programming

analysis, preparation and coding, and use of computer programs specifically written for governmental applications. *M.P.A. elective.*

POL 3630 Health Administration

A focused introduction to the process and purposes of management within hospitals and other health care organizations. Topics covered include financial management, quality control, strategic planning, personnel management, marketing, and information systems. *M.P.A. elective.*

POL 3631 Urban Development

This course is designed to help students analyze urban development issues and to learn how to be effective in creating and implementing public development policy and programs. We will explore subsidies and taxes, housing, commercial and industrial development, and job creation and training projects in terms of their historical, political, economic, and social dimensions. The emphasis is to learn to develop a development program through the role-playing method. *M.P.A. elective.*

POL 3632 Public Fiscal Management

A study of the interrelationships in public administration between systems of finance and the achievement of program objectives. Emphasis is placed upon those aspects of the budgetary process that bear on fiscal policy and appropriations. *M.P.A. core course.*

POL 3634 Functions and Techniques of Public Management

An introduction to problems in public management and techniques for dealing with them including functions of middle management, supervision, administration of staff activities (e.g. planning, personnel, budget), organization and methods, public relations, managerial use of computer-based techniques, and tactics and strategies of management. *M.P.A. elective.*

POL 3635 Environment and Energy Policy

Consideration of the legal, political, administrative, and intergovernmental factors involved in the formulation of public policy and the exercise of public power in regulating the use of the environment. Individual research is stressed. *M.P.A. elective.*

POL 3637 Comparative Public Administration

A comparative study of approaches to public administration in selected democratic governments in the United States and Europe. *M.P.A. elective.*

POL 3639 Federal Administrative Law

Study of rule making, adjudication (formal and informal), administrative finality and judicial review, administrative procedure, scope of administrative powers, and enforcement techniques. *M.P.A. elective.*

POL 3640 Governmental Accounting

Examination of principles and procedures involved in governmental accounting. *M.P.A. elective.*

POL 3641 Techniques of Program Evaluation

A review of methodologies for assessing public policy outcomes with a special emphasis on health and

social welfare programs. Topics include experimental and quasi-experimental research designs, the value and limits of case analysis, political and organizational barriers to effectively conducting an evaluation, writing the evaluation study report, and procedures for instituting needed program change following the evaluation. *M.P.A. elective.*

POL 3642 Management Planning and Decision Making

A review of the growth of the planning approach to public management and of its application in specific agencies. Topics include organization of the management planning function, budget planning, and methods of providing planning forecasts. *M.P.A. elective.*

POL 3643 Organizational Psychology and Behavior

Examination of the literature, theories, and concepts of administrative behavior as it has evolved with emphasis on the development of self-awareness and the building of interpersonal skills. *M.P.A. elective.*

POL 3644 Public Policy Issues in Human Services

Discussion of the origins and development of the Social Security Public Assistance Income Maintenance and various health-care programs. The course content focuses on controversial public policy issues of retirement, survivors, disability insurance, Aid to Families with Dependent Children, Medicare, and Medicaid, with the objective of helping students to develop understanding of the push and pull of many different viewpoints involved in public policy development. *M.P.A. elective.*

POL 3645 Program Implementation

This course examines the implementation stage of the policy process, specifically the implementation of federally funded social programs by local governments. Topics include: intergovernmental fiscal configuration; the capacity to implement; the politics of implementation; implementation feasibility.

POL 3646 Position Management

An examination of the bases of position classification at the state, federal, and local levels. After reviewing the process of job analysis, the course examines several classification schemes including the new federal factor benchmark system. Final topics include wage and salary administration. *M.P.A. elective.*

POL 3647 Manpower Policy and Administration

Introduces the student to human resource policy and management issues within a broader context of social policy. Includes an investigation of specific manpower programs and current issues of importance to the administrator. *M.P.A. elective.*

POL 3648 Legal Topics for Health Administration

An overview of legal issues and topics of relevance to the field of health administration, including malpractice, accreditation, and affiliations. *M.P.A. elective.*

POL 3649 Regulatory Administration

This seminar is designed to offer the public manager a conceptual and historical overview of the develop-

ment of regulatory policy and mechanisms, focusing on issues at the public-private interface as well as evaluating the practical implications of government intervention. Also included is an evaluation of the political, economic, and administrative effects of a nonregulatory vs. regulatory approach to public management. *M.P.A. elective.*

POL 3650 Group Dynamics

Based upon an introductory understanding of organizational psychology and behavior, this seminar focuses on the human problems public managers face in their daily work. Using a group dynamics format, each participant will have the opportunity to integrate the literature in organizational psychology, work issues, and personal growth concerns. *M.P.A. elective.*

POL 3652 Civil Liberties in Public Administration

Discussion of First Amendment rights as they impact upon the public sector. Referring to appropriate court cases, topics include employee rights and obligations with respect to freedom of speech, freedom of association, loyalty oaths, and professional certification, as well as legislative powers. *M.P.A. elective.*

POL 3653 Survey Research for Public Administration

Focuses on the entire survey research process from ample selection to data analysis. Regression for time series analysis and some computer applications are discussed. *Prereq. POL 3605*

POL 3654 Computer Software for Public Administrators

This course will be offered as an elective at least once per year. The course will provide an introduction to several software packages for: statistics; management file construction and use, word processing, and graphics. *Prereq. POL 3605.*

POL 3655 Politics and Administration in Cities and Towns

An examination of the political and administrative structures which influence the conduct of city and town governments. Particular attention is given to the dynamic relationships between these structures and the implications for public policy-making. *M.P.A. elective.*

POL 3656 Business-Government Relations

This course extensively examines the relationship between the United States government and the private economy from a historical and a contemporary perspective. A number of public policy areas in which public and private actors interact will be analyzed. Stabilization policy, regulation, antitrust, and social welfare policy will be examined in the context of alternative interpretations of the U.S. political economy. *M.P.A. elective.*

POL 3657 Organizational Analysis

A study of the structure and processes of organization essential for problem solving and for effecting organizational change. Emphasis is placed upon the

application of social science theory and administrative principles in administrative problem identification and problem resolution. *M.P.A. elective.*

POL 3658 State and Local Finance and Budgeting

This course explores the many channels that the state budget must travel before it becomes a viable document. The several ways by which the budget can be affected before and after it is signed into law are explored in depth. *M.P.A. elective.*

POL 3659 Municipal Finance

A discussion of the special problems of budgeting and finance in local governments, including budget preparation and presentation, debt management, capital financing, and local taxation policy. *M.P.A. elective.*

POL 3660 Development Planning

Development Planning focuses on the dynamics and activities of host-government, bilateral, and multilateral organizations as they analyze and tackle such problem areas as agriculture, education, health, population, and land reform in developing countries. Specific attention is paid to the special role of public administration in less developed countries. *M.P.A. elective.*

POL 3661 Municipal Law

Designed for the nonlawyer, this course reviews the law of municipal corporations. Topics include general powers and duties, charters, ordinances, administrative rules and regulations, officers and employees, tort liability, policy powers, planning and zoning, taxation and borrowing, elections, and licenses and permits. *M.P.A. elective.*

POL 3662 Comparative Urban Government and Administration

This course analyzes decision-making structures and processes in selected urban areas, including an examination of world organization trends and implications for administration and politics of cities; changing scopes, scale, participants, and organization of urban politics; and selected issues such as urban housing, finance, leadership, planning and goals. *M.P.A. elective.*

POL 3663 Techniques of Public Budgeting

Introduction to the practical skills necessary for the formulation, evaluation, and presentation of budget data. Budgetary information (raw data) provided from computer simulations and from state and local governments is analyzed and adapted to various types of budget formats. *M.P.A. elective.*

POL 3664 Contemporary Issues in Public Finance and Budgeting

The study of public budgeting in the context of the political, financial, and economic environment of present-day government. A heavy focus on contemporary issues and events which affect budgetary processes in the public sector is included. *M.P.A. elective.*

POL 3665 Women in Public Management

Analysis of the multiple roots of problems experienced by women in public management positions and solutions for alleviating such problems. Students are expected to engage in experiential learning exercises in addition to academic work. *M.P.A. elective.*

POL 3666 Housing Crisis

This course surveys the housing problems associated with the poor, the elderly, and middle-class citizens. It studies housing policies which have been enacted on the national and local levels and assesses the impact of these policies.

POL 3667 Equal Opportunity in Public Administration

This course is designed to (1) examine barriers to EEO, (2) help students develop an awareness of issues surrounding the Affirmative Action Program and particularly some of the historical perspectives of discrimination against minorities and women; and (3) offer instruction in techniques for developing a meaningful equal opportunity program for public organizations. *M.P.A. elective.*

POL 3668 Legal Issues in Public Personnel Administration

A review and discussion of fact situations and evidence which give rise to public employment litigation with emphasis on civil rights and Equal Employment Opportunities court actions. Class discussion includes the type of evidence used in litigation and the types of defenses available to public employers. *M.P.A. elective.*

POL 3669 Labor Relations in Public Administration

Examination of various theoretical models for analyzing labor-relations structures and dynamics as well as their historical development in the United States. Where appropriate, attention is given to private sector patterns for comparative analysis. Among the topics treated are bargaining unit determinations, management rights and the scope of bargaining, coalition bargaining, impasse-procedure options, contract administration, affirmative action, civil-service traditions, and public sector unions. *M.P.A. elective.*

POL 3670 Public Relations in Public Administration

Focuses on evaluating the public manager's role in the process of communication with the public. Issues of imagery and accountability as well as current topics are evaluated. *M.P.A. elective.*

POL 3671 Social Welfare Policy and Administration

The historical, political, social, and economic determinants of the U.S. social welfare system are examined. Present policies and programs are analyzed using a dynamic systems model. Practical experience from all levels of government is included. *M.P.A. elective.*

POL 3672 Policy Issues and Administration in Mental Health Care

An analysis of policymaking and administration within the contemporary mental health system, with a special focus on the process and impacts of deinstitutionalization. *M.P.A. elective.*

POL 3673 Career Development

Designed to help students make career choices, identify their own career stages, and better understand their role as part of a work organization, with the purpose of assisting students in career planning. *M.P.A. elective.*

POL 3674 Federal, State and Local Financial Relations

As state supervision of and assistance to local governments in the area of financial administration is becoming increasingly important, this course explores the relationships between the two levels of government in the assessment and collection of taxes, budgeting, debt management, and state aid. In addition, the federal role and fiscal intergovernmental relations are evaluated. *M.P.A. elective.*

POL 3675 Health Policy and Politics

This course is an intensive introduction to the study of modern health care policies, programs, and politics. The course begins with a descriptive overview of the contemporary health system in America, followed by analysis of major issues and problems in the areas of ambulatory care, acute inpatient care, and long-term care services. The current crisis in health care costs will also be discussed, together with various proposed solutions such as health planning, certificate-of-need regulation, and different health insurance reimbursement mechanisms. Other topics include the deinstitutionalization of the mentally ill, medical ethics, and the foreign experience in health care. *M.P.A. elective.*

POL 3676 Practices in Self-Development in Public Management

This course focuses upon practical aspects of public management. Topics include time management, communication (e.g., memorandum and report writing), control processes, and conflict management.

POL 3677 Elder Services Policy and Administration

This course investigates the historical, socio-economic and philosophical determinants of the emerging elder services system. Present policies and programs are studied using various comparisons, case studies, and dynamic models. Focus on contemporary problems in the administration of elder care delivery systems, funding sources, and future trends.

POL 3678 Federal Bureaucracy

Examination of dynamic and structural aspects of the national government, with attention to the place of the national administration in the federal system. *M.P.A. elective.*

POL 3679 Case Studies in Developmental Administration

Using the case-study method, students will simulate actual management situations on the project level. Open to those students who have completed Development Administration (POL 3615), or by permission of the instructor. *M.P.A. elective.*

POL 3690 Topical Seminar

The program occasionally offers a special seminar dealing with current important issues relevant to public administration.

POL 3696 Politics of Finance and Budgeting

This course examines the political environment of public budgeting from both historical and contemporary perspectives. Special attention will be given to the relationship between executive and legislative institutions at the federal, state and local levels. *M.P.A. elective.*

POL 3697 Seminar in Public Personnel Administration

Analysis of specified topics and issues in public personnel administration with the purpose of presenting material of current interest and allowing in-depth research into specified areas where appropriate. Subject matter to be covered is described in registration materials. *M.P.A. elective.*

POL 3698 Case Studies in Policy Analysis

This course provides the opportunity for detailed analysis of key issues in public policy. Students will complete oral and written analyses of case studies

that reflect these issues. Emphasis is placed on developing the ability to utilize the relevant analytic techniques in resolving the problems confronting government. *M.P.A. elective.*

POL 3699 Seminar in State and Urban Administration

Analysis of specified topics and issues in state and urban administration with the purpose of presenting material of current interest and allowing in-depth research into specified areas where appropriate. Subject matter to be covered is described in registration materials. *M.P.A. elective.*

POL 3798 Master's Thesis Continuation

POL 3884 Assigned Reading **1 Q.H.**
Assigned reading under supervision of a faculty member.

POL 3886 Assigned Reading **3 Q.H.**
Assigned reading under the direction of a faculty member.

POL 3890 Assigned Reading **6 Q.H.**
Assigned reading under supervision of a faculty member.

POL 3892 Internship Readings and Analysis
Academic credit directly related to an internship assignment.

POL 3895 Thesis **6 Q.H.**
Thesis supervision by individual members of the department.

Psychology

All courses carry three quarter-hours of credit unless otherwise specified.

PSY 3111, PSY 3211, PSY 3311 Quantitative Methods I, II, III

A survey of the quantitative methods used in experimental psychology, emphasizing applications of computer programming, theory of functions and relations, curve fitting, probability functions, set theory, and analysis of variance.

PSY 3011, 3013, 3015, 3016, 3018, 3019 Proseminar

The departmental proseminars are first-level graduate courses. They include faculty lectures, student presentations and discussions of important theoretical, experimental and methodological approaches to the understanding and explanation of behavior and the mental processes underlying behavior. Issues relevant to the following areas are emphasized: language and cognition; learning, motivation and behavior analysis; neuroscience; sensation and perception.

PSY 3119, 3219, 3319 Attention I, II, III

Seminars dealing with the topic of attention (selective and general, e.g., arousal, attentiveness, etc.).

Behavioral, cognitive and physiological aspects will be discussed.

Learning and Behavioral Analysis

PSY 3121 Experimental Design in Applied Research
Detailed study of experimental methods, emphasizing critical analysis of published research reports and the implementation of the methods in service settings. Students have the opportunity to learn and evaluate observational measurement and data-collection techniques. A feasible experimental design, with graphed actual or hypothetical data, must be written in the form of a scientific report.

PSY 3122, PSY 3222, PSY 3322, PSY 3422, PSY 3522 Applied Programming Seminar I, II, III, IV, V

Students are expected to design, test, and evaluate instructional programs for teaching specific subject matter for remedial application to behavior problems and to test instructional theory. Supervision is provided by a weekly programming research and data seminar in collaboration with the student's adviser.

PSY 3123 Programmed Learning

A review of the history and theoretical and experimental bases of programmed instruction and errorless learning. Emphasis is placed on the detailed analysis of stimulus control—its measurement, and ways to produce it.

PSY 3129 Mental Retardation Seminar

Interdisciplinary seminar taught by faculty from the several Boston-area universities associated with the University-affiliated facility. The role of each discipline in the care and treatment of retarded people is defined and coordinated with the functions of other relevant disciplines. Specialties include communication disorders (Emerson College), dentistry (Tufts University), medical disciplines (e.g., pediatrics, neurology, orthopedics, genetics—Massachusetts General Hospital, Harvard Medical School), nursing (Boston University), nutrition (Framingham Teacher's College), occupational therapy and physical therapy (Sargent College of Boston University), social work (Boston University and Simmons College), sociology (Brandeis University), special education (Boston University), and psychology (Northeastern University).

PSY 3132, PSY 3232 Behavior Intervention I, II

Students are given instruction in behavioral intervention techniques. Emphasis is placed on the functional analysis of behavior.

PSY 3133, PSY 3233, PSY 3333 Advanced Learning Seminars I, II, III

These seminars cover contemporary research in operant conditioning, with emphasis on relating the techniques of behavioral analysis to problems of reinforcement, motivation, comparative psychophysics, and physiological psychology.

PSY 3336 Memory

Seminar covering theoretical, experimental and methodological issues relevant to the study of remembering and forgetting.

PSY 3143, PSY 3243 Learning Principles 4 Q.H. and Applications I and II

An analysis of principles from behavioral learning research and their application to the process of behavior change for learning, remediation, and treatment. Particular emphasis is on educational settings.

PSY 3229 Administration of Mental Retardation Services

Presents comprehensive overview of general and specialized services for retarded individuals from organizational and administrative points of view. Issues in planning and initiating new programs, service delivery, staffing, and economics are covered. Visits to varied types of facilities focus on administrative concerns.

PSY 3321, PSY 3421, Systematic Inquiry in Applied Research I, II

Each student is expected to collect a comprehensive bibliography on a significant topic in applied behavior research and complete a thorough review via

written and oral presentations. Emphasis is placed on the integration and analysis of experimental findings and theoretical foundations of the research area, the critical evaluation of current research, and the definition of potentially fruitful future work.

PSY 3649 Community Based Treatment 3 Q.H. (Prereq. Permission)

The treatment of mentally retarded individuals in a community setting.

PSY 3324 Behavior Change in Institutions

A review of successful projects which have been carried out to provide effective remediation and rehabilitation in institutions for the mentally retarded, the juvenile delinquent, and the developing individual (schools).

Sensation and Perception**PSY 3185 Electrophysiological Recording**

Methods for recording electrophysiological activity from the human subject including electroencephalography, auditory and visual-evoked potential recording, electroretinography. Consideration of some of the principal findings that have been obtained with these methods and their importance for the interpretation of a variety of psychological phenomena.

PSY 3188, PSY 3288, PSY 3388 Vision I, II, III

Seminars: classical and modern problems in vision. Recent journal articles provide primary source materials for discussion. Consideration is given to problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

PSY 3189 Psychoacoustics

This seminar deals with the relationship between sound and auditory perception. After five tutorial sessions on the physics and laboratory generation of sound, thresholds, masking, loudness, pitch, and sound localization, students are expected to lead discussions based on research papers in the psychoacoustic literature.

PSY 3289 Perception

A detailed consideration of research in such areas as form, space, and pattern perception, recognition, and the effects of set and motivation on perception. Physiological concomitants of perceptual phenomena are considered.

PSY 3418 Modern Psychophysics

A mathematical study of signal-detection theory; human and animal psychophysical methods; theory of the ideal observer.

Neuropsychology**PSY 3127, PSY 3128 Neurological and Sensory Impairments Seminars I, II**

Etiology, assessment, and diagnosis, clinical characteristics, and education of the mentally retarded with visual, hearing, and motor deficits are studied. In addition to discussion, experiences are provided

in evaluation and remedial programming, via the application of operant techniques.

PSY 3145 Human Neuropsychology 1 3 Q.H.

This course in neuroscience addresses brain function and structure. Specific disorders seen in the clinical population are related to disfunction of the nervous system.

PSY 3151 Brain and Behavior I

An introduction to basic methods of physiological psychology, including animal surgery, electrical stimulation of the brain, electrophysiological recording, and histological techniques. Students have the opportunity to gain experience in these methods by carrying out a limited research project during the semester. Enrollment limited to ten. *Prereq.: Admission to doctoral candidacy or permission of instructor.*

PSY 3155, PSY 3255 Sensory Psychophysiology I, II

Concentration on the anatomy and physiology of the various sensory systems and correlation of these data with psychophysical and perceptual concepts. Laboratory work is included.

PSY 3159 Neurochemistry and Behavior

This seminar examines different experimental approaches to the problems involved in uncovering the relationships between changes in brain activity and changes in behavior produced by drugs. Discussions center on current theorizing on the role of early experience, environmental factors, biological rhythms, and other facets in the determination of drug-induced behavioral changes.

PSY 3225 Biological Bases of Mental Retardation

The course considers the relationship between biological malfunction, of the brain in particular, and the defective learning ability and other behavioral abnormalities which constitute mental retardation. The aim is toward as comprehensive a survey as time permits. Exercises include actual case presentations as illustrative examples.

PSY 3251 Brain and Behavior II

Selected topics in the neurophysiology of perception, emotion, motivation, learning, and memory will be pursued in depth, with emphasis upon a critical evaluation of recent literature. Enrollment limited to fifteen. *Prereq.: Admission to doctoral candidacy or permission of instructor.*

PSY 3355, PSY 3455, PSY 3555 Physiological and Comparative Psychology I, II, III

Seminars: a shared background, key concepts, and central issues in the field of physiological and comparative psychology.

Language and Cognition

PSY 3126 Child Language Development

Learning theory approaches to language acquisition are contrasted with psycholinguistic and neurogenic

theories. Works of Skinner and Chomsky are analyzed, and implications for both normal and abnormal language development are discussed.

PSY 3161, PSY 3261 Cognition and Psycholinguistics I, II

Research in cognition and psycholinguistics.

PSY 3166 Psycholinguistics

Seminar. In-depth analysis of research methods and findings in selected problems in the psychology of language, including developmental, anthropological, and experimental psycholinguistics.

PSY 3169 Seminar in the Structure of American Sign Language

This seminar is designed to introduce students to current issues in linguistic theory as well as to update them on the specific literature on ASL research. Focus is upon one particular area of linguistic theory as it relates to current ASL research, e.g., phonology, morphology, syntax, semantics, or discourse (varies from year to year).

PSY 3264 Language Acquisition 3 Q.H.

An overview of issues in language acquisition will be integrated with in-depth discussions of selected topics.

PSY 3269 Linguistic Theory and ASL: Special Topics 3 Q.H.

(*Prereq.: Introduction to ASL Linguistics or Introduction to Linguistics*)

This seminar will vary year to year. Each year we will focus upon a particular body of literature related to current linguistic theory and its relevance to ASL. The course will involve extensive reading of current articles and dissertations in linguistics in general and in ASL Linguistics. Students will be expected to do presentations during the course of the seminar.

Experimental Personality and Social Psychology

PSY 3171, PSY 3271 Psychopathology I, II 4 Q.H.

A detailed consideration of the major forms of psychopathology, including the neuroses (obsessional states, hysteria, anxiety states, phobias), the psychoses (schizophrenia, mania, depression, paranoia), psychosomatics, sociopathy, conduct disorders, organic disorders, and mental retardation.

PSY 3371 Social Psychology

Survey of theory and research in social psychology. Topics covered include attitude and attitude change, aggression, altruism, group processes, person perception, and social cognition.

PSY 3477, PSY 3577, Personality Theory and Research I, II

A survey of representative theoretical formulations of the normal personality and its development, and an examination of experimental evidence bearing upon relevant concepts and assumptions (anxiety, repression, aggression, cognitive styles).

Special Topics

- PSY 3291 Research Laboratory

1 Q.H.

Students and their faculty advisers discuss laboratory projects, current literature, theory, and applications.
- PSY 3419 Special Topics in Psychology max. 9

Q.H.
- PSY 3521 MABA Research

0 Q.H.

Students enrolled in the M.A.B.A. program may sign up for this course beginning in their *third* year to indicate that they are continuing their research.
- PSY 3549 Practicum

3 Q.H.

Supervised practicum experience emphasizing the application of principles of psychology to human behavior.

- PSY 3798 Master's Thesis Continuation

0 Q.H.

Continuation of experimental work for the master's degree requirement.
- PSY 3799 Doctoral Dissertation Continuation

0 Q.H.

Continuation of experimental and theoretical work for Ph.D. candidates.
- PSY 3891 Thesis

6 Q.H.

Experimental work for the master's degree requirement.
- PSY 3894 Dissertation

0 Q.H.

Experimental and theoretical work for Ph.D. candidates.

Business Administration

Graduate School of Business Administration

All courses carry three quarter-hours of credit unless otherwise indicated. Please see the current schedule for summer, fall, winter, and spring quarter listings.

ACC 3301 Financial & Managerial Accounting

Examination and evaluation of financial and managerial processes designed to develop the participant's ability to request, use and supply financial information. Topics include financial statement analysis, funds flow, cost behavior, budgeting, capital investment analysis and management control systems. *For non-Business majors.*

ACC 3781 Health Care Accounting and Control

This course examines hospital and other health organizations' managerial accounting requirements and practices. Rate setting and reimbursement policies and their effect on cash flow and the financial position of health institutions are also examined.

Prereq.: ACC 3813.

ACC 3811 Financial Accounting

An introduction to the accounting system and the techniques of recording, summarizing, and reporting the flow of financial information through the entity concerned. The course presents an examination of the information flow process plus the necessary techniques for analysis and evaluation of the firm's potential in the light of historical data. *Prereq.: none.*

ACC 3812 Management Accounting

An examination of the role of accounting in controlling the operation of the business entity and the relation of cost and volume to profits. Decision-making techniques using accounting information are stressed. The use of programmed budgets as a planning, motivating, coordinating, and control device is emphasized. *Prereq.: ACC 3811.*

ACC 3813 Management Control Systems

The study of short and long-range programs and their integration within the control mechanism; the enhancement of goal setting, achievement, motivation, and evaluation. Primary emphasis is on the decentralized organization with multiple operation divisions. *Prereq.: ACC 3812.*

ACC 3903 Management Control in Nonprofit Organizations

This course will utilize lectures, class discussions, and case discussions to help students develop an understanding and working knowledge of: the role of the manager in the nonprofit control process; the design and implementation of a new control system; the management of a system which will adapt to changing environments and organizational needs; the characteristics of bureaucratic behavior and problems associated with implementing a control system where it may not be desired or understood; and methods of defining and relating the inputs and outputs of nonprofit organizations, including the use of cost accounting, capital and program budgeting,

personnel systems, and benefit/cost analysis. *Prereq.: ACC 3813.*

ACC 3918 Corporate Financial Reporting and Analysis I

An intensive investigation of contemporary financial reporting problems. Conceptual and pragmatic issues of income determination and financial disclosure are discussed. Primary emphasis is placed on interpretation and analysis of alternative accounting treatments. The perspectives of various financial statement user groups are explored. *Prereq.: ACC 3812.*

ACC 3919 Corporate Financial Reporting and Analysis II

Continued examination of the financial reporting environment. Analysis of the economic consequences of complex transactions and related disclosures. Survey of current reporting requirements and analysis of recent developments in financial reporting. *Prereq.: ACC 3918.*

ACC 3922 Auditing

An introduction to the function of the public accountant. Matters of professional conduct and ethics, legal liability, generally accepted auditing standards, internal control, statistical sampling, audit reports, and the impact of electronic data processing on auditing are covered. Although a conceptual approach is employed, auditing procedures as they relate to specific areas are covered. *Prereq.: ACC 3812.*

ACC 3962 Tax Factors in Business Decisions I

A survey of the Internal Revenue Code and its implications for choice of organizational form, corporate reorganizations and compensation policies. Mergers and acquisitions and the management of depreciable property are examined in the light of decisions made by the Internal Revenue Service and the tax courts. Emphasis is on tax planning and research into corporate income tax problems that affect business decisions. *Prereq.: 15 Q.H. of grad. credit.*

ACC 3963 Tax Factors in Business Decisions II

This course is designed to establish an in-depth understanding of selected tax planning topics: deferred compensation plans, mergers and acquisitions, small business organization, and business planning interaction with estate planning. *Prereq.: ACC 3962 or permission of instructor.*

ENT 3922 Small Business Consulting

This course is designed to help students who have completed courses in the major functional areas achieve insights into the consulting sector of our business society. Special emphasis is placed upon tools used in problem identification and in seeking

realistic solutions for the small business community. Each student will be assigned to a team that will be applying these skills with a small business in an attempt to find solutions to a real, current problem. A final written report and oral presentation is required for this consulting assignment. *Prereq.: 15 q.h. of grad. credit.*

ENT 3929 New Ventures: A Career Choice

Enables students to examine the nature of entrepreneurship and the appropriateness of self-employment for an individual. Focus is on the decision to own and operate one's own business. Students have the opportunity to examine the values, motivations, goals, and life style required by the entrepreneurial role. Guest speakers, cases, selected readings, and self-assessment exercises help students identify the congruency between their own interests and goals and an entrepreneurial career. Also recommended for prospective loan officers, investment bankers and venture capitalists, CPA's, management consultants, and others whose career activities may involve them with entrepreneurs and managers of new ventures or smaller companies. *Prereq.: 15 Q.H. of grad. credit.*

ENT 3965 Management of Small Business Enterprises

Explores the operating problems of managing small enterprises. Case studies develop analytical approaches for appraising the risks and rewards of potential growth opportunities, as well as operating problems. Problems range from locating, evaluating, and financing a small company to the survival and growth of an established business. Guest speakers relate pertinent business experiences to in-class activities. *Prereq.: 15 Q.H. of grad. credit.*

ENT 3968 Management of New Enterprises

This course discusses the basic ingredients of small business, including problems and pitfalls. There is an orientation toward entrepreneurs including start-ups and buy-outs. Topics include 1) business opportunities introduced through new ideas, product development, licensing, inventions, patents, etc., and 2) organization, start and growth of a new business on the acquisition of a going concern, including fund raising and related regulations. *Prereq.: 15 Q.H. of grad. credit.*

FIN 3301 Financial Analysis

The flow of funds within an organization, working capital management, capital markets, capital budgeting and financial analysis. Builds on topics covered in Financial and Managerial Accounting. *For non-Business majors.*

FIN 3760 International Financial Management

Deals with the specific concepts, policies and techniques for the financial management of the multinational firm are discussed in this course. Specific topics include operations of the foreign exchange markets, managing foreign exchange risk, sources and instruments of international financing, foreign direct investment and the management of political

risk, multinational capital budgeting, and financing control systems for the multinational firm. *Prereq.: FIN 3812.*

FIN 3770 Small Business Finance

This course utilizes the basic processes, principles, tools, and concepts of finances within the parameters of a small business to develop a complete financial plan. The main objective is to construct a comprehensive plan that projects the future circular flow of funds by analyzing and then integrating the impact of both investment decisions (use of funds) and financial decisions (source of funds). *Prereq.: FIN 3812.*

FIN 3811 Financial Management I

This course and its required sequel, FIN 3812, present concepts, practices, and procedures of financial management, and offer training in analytical approaches helpful in making wise decisions affecting the flow of funds available to an organization. Topics include financial analysis and forecasting, domestic and international working capital management, and an introduction to security types and markets. Instruction is primarily through readings and cases. *Prereq.: ACC 3812.*

FIN 3812 Financial Management II

Through readings and cases, this course concentrates on long-term sources and uses of funds, including capital budgeting techniques, dividend policies, and the concept of cost of capital. Risk and return trade-offs are also studied. Broad topics of overall financial strategy and timing are examined in both a domestic and an international setting. *Prereq.: FIN 3811.*

FIN 3901 Financial Strategy

This course offers the opportunity to study several important areas of financial management in greater depth than is possible in the basic finance courses. Emphasis is on strategies that financial managers can pursue to maximize the value of their firms. Instruction is primarily through reading and classroom case discussions. *Prereq.: FIN 3812.*

FIN 3916 The Management of Financial Resources

A thorough analysis of capital budgeting techniques and portfolio considerations is combined with an assessment of factors affecting a firm's capital structure. Company assets and how they should be financed are the central questions. The most recent developments in financial management are explored. *Prereq.: FIN 3812.*

FIN 3918 Working Capital Management

This course examines strategies of and analytical approaches to managing current assets and current liabilities. It explores corporate cash management under changing money market conditions and discusses the use of interest rate futures and working capital management in a multinational context. *Prereq.: FIN 3812.*

FIN 3920 Real Estate Investment and Analysis

This course helps provide students with a comprehensive understanding of real estate finance. Factors affecting real estate investment are emphasized. Specific topics covered include: valuation (appraisal), market analysis, development, taxation, ownership types, short-term financing, mortgage markets, and investment strategies. The course is designed for students interested in a general overview of real estate finance, as well as those intending to pursue a career in the real estate field. *Prereq.: FIN 3812 and MSC 3803.*

FIN 3921 Investment Analysis

Focuses on the development of a sound investment program, with attention to identification of investment principles, objectives, and risks. Emphasis is placed on the techniques of analysis, evaluation of various types of securities and the associated risks, the operation of the securities markets, and the various methods of portfolio management. *Prereq.: FIN 3812.*

FIN 3924 Mergers and Acquisitions

The environments that have recently given rise to a large number of corporate mergers and the business factors underlying these corporate combinations are the focus of this course. The financial, managerial, accounting, and legal factors affecting mergers are examined. Students have an opportunity to learn how to appraise a potential merger and structure a merger on advantageous terms. *Prereq.: FIN 3812.*

FIN 3925 Investment Banking

Issues presented are associated with policy, strategy, and administration of investment banking firms. Topics include issuance of securities, the service function of investment bankers, pricing a negotiated issue of common stock or competitive bid issue, and meeting the capital requirements of a securities firm. *Prereq.: FIN 3812.*

FIN 3926 Bank Management

Case studies and analyses are used to examine the management policies of commercial banks. The focus is on the lending, investment, and liquidity management policies of these financial institutions and on the current issues and problems they face. *Prereq.: FIN 3812.*

FIN 3927 Portfolio Management

This course deals with portfolio construction, revision, and performance measurement. Portfolio construction in an efficient capital market is highlighted. Critical subjects to be explored are risk-return analysis, the effects of diversification on risk reduction, and the costs of inflation, taxes, and transaction costs on fixed income and equity security portfolios. Financial models of capital asset pricing are examined as the basis for the analysis of portfolios from the institutional investor's viewpoint. *Prereq.: FIN 3921.*

FIN 3928 Risk Management and Insurance

This course introduces the student to the concepts of risk and risk bearing in the business firm. It exam-

ines risk identification and analysis, measurement of loss possibilities, and the principal methods of managing such contingencies. The focus of the course is broad enough to include some nontraditional areas, such as speculative risk and foreign operations. Insurance is discussed in detail as a major method of managing certain types of risks. Particular emphasis is placed on aspects that directly relate to the financial management function, such as insurance markets and products, selecting insurers and insurer intermediaries, legal frameworks involved in the transfer of risk to insurers, pricing of insurance contracts, and principles followed by insurers in selecting risks. *Prereq.: FIN 3812.*

FIN 3930 Speculative Markets

The purpose of this course is to familiarize the student with all aspects of speculative markets, including options, futures, and options on futures. This is intended as an overview course. *Prereq.: FIN 3921.*

FIN 3932 Options Markets

This course provides students with a comprehensive understanding of the options markets. Topics include the structure of options markets and options contracts, option pricing models, option trading strategies, and the risks and opportunities of investment in options. *Prereq.: FIN 3812.*

FIN 3935 Management of Financial Institutions

This course offers a broad study of the decision-making problems faced by financial institutions such as commercial banks, thrift institutions, pension funds, insurance companies, and finance companies. Topics include the nature and scope of the capital markets confronting these institutions, specialized problems regarding their sources and uses of funds, the nature of the competition, regulatory constraints, and strategic policy planning of the financial institutions. *Prereq.: FIN 3812.*

FIN 3936 Seminar in Finance Theory

This seminar provides an intensive coverage of issues in the theory of finance. A framework of conceptual knowledge is built and the evidence to support the theory is examined. A survey of the current literature, student research, and the presentation of papers form important components of the seminar. *Prereq.: FIN 3812.*

FIN 3950 Management of Investor Relations

This course will explore the scope and nature of the investor relations function. It will describe various target audiences, review financial disclosure requirements, and discuss the effectiveness of various financial communication techniques. The course will focus on the workings of the capital markets and the factors affecting a firm's stock price from the standpoint of the investor relations manager. *Prereq.: FIN 3812.*

HRM 3301 Organizational Behavior

A critical component in preparing for increased responsibilities is the management of human resources. Students will study leadership, group dynamics, mo-

tivation, power, business ethics, organizational structure and change. Emphasis is placed on practical application of specific skills, theories and concepts. *For non-Business majors.*

HRM 3760 International Human Resource Management

This course covers basic issues in human resources management relevant to managing in international and cross-cultural environments. Topics include selection and training of personnel for work in multi-cultural environments, managing the international employee in the United States and abroad, cross-cultural communication, international environments, special issues of concern to small business, and change in multinational companies *Prereq.: 15 Q.H. of grad. credit.*

HRM 3784 Human Resource Management in Health Organizations

Relates the traditional personnel (human resource management) functions: service, audit and control; the new functions: corporate policy formulation planning, advice and counsel, and innovation to the unique problems of Health Care Organizations. To a large extent union organization and negotiation efforts, depicted in cases and mock negotiation exercises, focus on the conflicting issues between traditional personnel approaches, and the questioning of management authority and rights by unions and other regulatory policies and agencies. *Prereq.: HRM 3816.*

HRM 3815, Behavioral Concepts and HRM 3816 Organizational Behavior I

The first half of this two-course sequence examines major concepts and findings of the behavioral sciences which have particular pertinence to business and administration. Systematic ways of understanding behavior are developed. Specific topics include human development and motivation, interpersonal perception and communication, and small groups processes. The second half of the course sequence relates these basic concepts to specific aspects of behavior in formally constituted organizations. Supervisory behavior is examined in the behavioral context, as well as in relations between groups, in efforts to develop ways of achieving collaboration. *Prereq.: none.*

HRM 3817 Organizational Behavior II

The study of behavior in organizations is expanded in order to understand and deal systematically with the complex relationships found in larger organizations. An opportunity is provided to apply knowledge about people in organizations to the improvement of organizational systems and to the process of achieving changes in organizations. *Prereq.: HRM 3816.*

HRM 3905 Selection and Assessment

This course focuses on personnel recruitment, selection, and assessment. Basic issues and procedures such as realistic recruitment, the impact of the EEOC, decision strategies, and utility will be covered

in detail. The basic tools examined will be testing, interviewing, and application blanks. Readings and outside projects will be used in a class discussion/lecture format. *Prereq.: none.*

HRM 3913 Managing Power and Influence

Explores through cases, readings, and videotape the complex issues involved in the use of power and influence in organizations and how to manage these issues in ways that are organizationally effective and socially responsible. Topics include: a) the dynamics of power within organizations; b) the methods by which effective managers acquire and maintain power to manage critical dependencies and uncertainties; c) the important interdependency between power, influence and trust in organizations; d) analysis and action planning around one's own style of influence and use of power; e) the effects of these issues upon one's own career. *Prereq.: HRM 3816 and 15 Q.H. of grad. credit.*

HRM 3914 Management of Professionals

This course is designed to meet the need for improving the managerial effectiveness of professionals who will have increasing responsibility over the functional activities within their organizations. Course material will cover both micro concerns (i.e., individuals and project groups) and macro issues (i.e., organizational structure, design, and interfunctional relationships) including the following broad areas: supervising and motivating professional employees; dealing with professional obsolescence; career orientations; differences between scientific and engineering fields; effective conflict management; effective leadership in professional settings; technical problem solving and decision making; managing project teams; improving group processes; technical conformity, critical roles in the innovation process; effective technology transfer; the role of interpersonal, organizational, and architectural factors in effecting intra- and inter-organizational communication and technical information flows; and organizational diagnosis and change. *Prereq.: HRM 3816.*

HRM 3923 Managing Careers

This course will explore the dynamics through which the concerns, abilities, and experiences of individual employees are juxtaposed with the demands and requirements of various work environments. Students will address issues of individual differences in career orientation, entry and development problems of new employees, career progression patterns and the organization's role in providing training, career support systems, the management succession guidelines. *Prereq.: HRM 3816.*

HRM 3924 Organizational Behavior in a Nonprofit Environment

Human service organizations involved in health care, welfare, and education are studied in reference to recent behavioral theories and concepts dealing with the internal and external complexities and interrelationships of large-scale organizations. Term projects

are designed to conduct and analyze a problem situation and develop plans for implementing change. Readings, cases, and seminars. *Prereq.: HRM 3816.*

HRM 3930 Managing Performance: Evaluating Employees at Work

This course will focus on the critical issues of performance appraisal. Major attention will be given to the process of identifying performance criteria, to measurement techniques, and to the conduct of review sessions for administrative and development purposes. Students will be expected to acquire a thorough working knowledge of state-of-the-art appraisal techniques as well as ability to critically analyze and redesign deficient appraisal review systems. *Prereq.: HRM 3816 and 15 Q.H. of grad. credit.*

HRM 3945 Training and Developing Human Services

This course is aimed at those management generalists and human resource specialists who are concerned with maintaining organizational effectiveness through upgrading of the basic skills and abilities of a broad range of employees. The emphasis will be on diagnosis of the organization to assess whether training and development is needed, on techniques to decide who needs training; on developing an awareness of the many types of training methods and their relative strengths and weaknesses for various groups of employees, and problem areas; and on the design, implementation, and evaluation of training programs. *Prereq.: HRM 3816.*

HRM 3948 Organizational Development

Organizational development is a recognized management, discipline that uses behavioral science knowledge, action research, and specific intervention techniques to implement planned organizational change. This course explores the relative advantages of strategies such as team building, process consultation, goal setting, conflict resolution, and structural modification. *Prereq.: HRM 3816.*

HRM 3951 Executive Development

An examination of the executive position in an organization and the required personal characteristics and skills. The effects of cultural change and shifting mores on motivation and management control, with their implications for developing appropriate organizational relationships, are examined. Report writing, oral reports, and leading of group discussions are dominant techniques. Student evaluation is encouraged. *Prereq.: 15 Q.H. of grad. credit.*

HRM 3952 Interpersonal Dynamics

This course focuses on the human dilemmas which managers face in a wide variety of interpersonal relationships. The emphasis is upon interactions between individuals. The approach is humanistic and pragmatic; interpersonal communication is the central concept; case analysis and experiential learning (role-play) are the key teaching methods. *Prereq.: 15 q.h. of grad. credit.*

HRM 3954 Benefits Management

Designed as a companion or follow-up to Compensation Management, this course will focus on managing employee benefits within the overall corporate strategy. It will cover all aspects of benefits management, including plan design, funding, implementation, administration, and employee communication.

HRM 3955 Compensation Management

Covers policies and techniques of wage and salary administration. The course is practitioner-oriented with students designing and implementing compensation plans using case data. The course covers the technical aspects of developing a successful compensation program such as determining, weighing, and measuring compensable factors; assigning a total value to a job; grade collapsing procedures; reviewing wage and salary surveys; synchronizing internal with external salary structure; setting up "within grade" rate ranges; developing individual and group incentive compensation plans; developing group membership rewards; estimating labor costs; controlling and utilizing the compensation systems and complying with government and union compensation policy. Cases and readings will be used in a lecture/class discussion format. *Prereq.: 15 Q.H. of grad. credit.*

HRM 3958 Human Development and the Work Place

This course will explore the implications of recent theories about stages of adult development for managing people, careers, and organizations. Concepts of adult mental health, normalcy, and individual and organizational career planning. Techniques for dealing with human resource problems, such as employee assistance programs, will be discussed. *Prereq.: HRM 3816.*

HRM 3962 Human Resources Planning

This course focuses on the formulation and implementation of human resources planning strategies for organizations. It is concerned with such issues as the changing demographics of the labor force, forecasting manpower needs, the development of managerial succession systems, career management, performance appraisal, and compensation. Organizational needs assessment and job analysis will be linked to the changing role of government regulations and the human resource management function in corporations. *Prereq.: HRM 3816 and 12 Q.H. of grad. credit.*

HRM 3971 Human Resource Management

This course will focus on the critical issues and strategic questions faced by all organizations in their management of employees, while providing information about existing institutional arrangements and current personnel practices. *Prereq.: HRM 3816.*

HRM 3972 Labor Relations

Review of U.S. labor history and traditional labor policy, as well as implications of new regulatory systems on labor-management relations such as equal opportunity and safety. Overview of collective bar-

gaining processes applied to emerging sectors of union organization, including health care and education. Lectures, cases, and readings. *Prereq.: 15 Q.H. of grad. credit.*

HRM 3987 Leadership

This course studies the processes and responsibilities of leadership in organizations. A contingency approach is used which focuses on identifying different types of leadership behavior and on relating particular leadership styles to situational factors. Text, readings, and cases allow for application of the concepts discussed and self-assessment techniques follow the student to evaluate his or her own leadership qualities. *Prereq.: HRM 3816.*

INB 3910 Managing the Multinational Enterprise

Deals with international operations at the multinational enterprise; the interface between the firm and the international business environment; current issues in U.S. public policy affecting international business competition with Japan and with LDCs. *Prereq.: MEC 3809.*

INB 3911 Cultural Aspects of International Business

Using a managerial perspective, this course will cover issues that arise when a firm moves from its home country to a host country that may have a different national culture. Although it will usually take the perspective of the U.S.-based firm that operates abroad, it will spend some time on what happens to other national firms operating in the U.S. and in third country environments. The way in which "corporate culture" evolves in the context of national culture and the impact on managers will be a central issue. *Prereq.: 15 Q.H. of grad. credit.*

MEC 3808 Managerial Economics I

Macroeconomics for business managers. Acquaints students with the general economic environment and its impact on the firm. Topics include income and employment theory; classical, Keynesian, and monetarist aggregate demand and supply systems; money and capital markets; fiscal and monetary policy. *Prereq.: none.*

MEC 3809 Managerial Economics II

Entails the application of microeconomic principles to the business firm and its competitive environment. Cases and readings are used to demonstrate the practical application of economic models in the decision-making process. Specifically, the course covers demand analysis, production and cost analysis, market structure, and pricing practices. *Prereq.: MSC 3803.*

MGT 3750 Writing for the Professions

This course examines the various forms of business communications and offers practical experience in writing business letters, memoranda, case studies, proposals, and reports. When possible, speakers from business and industry will be invited to address the class on various problems encountered in management and executive level communications. Several

short (500-word) papers as well as one or two longer reports will be required. *Prereq.: none.*

MGT 3834 Strategic Management I

This first of three policy courses focuses on the environment in which strategy must be formulated in profit and nonprofit organizations. Techniques of environmental analysis are included, with particular emphasis on the political-legal, economic, social, and technological environments as they relate to and influence the formulation of strategy. *Prereq.: all other required courses with the exception of ACC 3813, and HRM 3817*

MGT 3835 Strategic Management II

Building on the materials presented in MGT 3834, this course examines strategy formulation. Particular emphasis is on the process by which strategy is formulated in actual business settings, including the influence of personal values on strategy formulation, who actually makes strategic decisions, what environmental and internal information is required to make strategic decisions, and what criteria are used to make the decisions. The role of different management levels in the process is considered. *Prereq.: MGT 3834.*

MGT 3836 Strategic Management III

The third required policy course compares and contrasts the approaches to strategy implementation in profit and nonprofit organizations. Topics include organizational structure and behavior, long-range planning, control and motivation systems, information systems, and leadership. All topics are considered within the systems framework of organizational strategy. *Prereq.: MGT 3835.*

MGT 3915 Business and Professional Speaking

This course is designed to give the students an opportunity to develop and deliver oral presentations as they apply to various business settings—focus is on formal as well as informal speaking situations. Emphasis is placed on helping the student develop skills in dealing with a variety of communication situations. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3918 Written & Oral Communication Strategies Management

Team-taught by members of the English and Speech Communication Departments, this course is designed to meet the individual's communications needs for contemporary business. Topics covered will range from oral communications with individuals and groups, to business letters and memos, to the impact of the electronic office on communication. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3939 Business Policy—An International Perspective

This course will explore the distinctive problems of formulating and implementing strategy in global businesses. New trends affecting the international competitiveness of U.S. firms will be discussed, and possible responses analyzed. Throughout the course

participants will be encouraged to view problems from the perspective of foreign firms and foreign governments, in addition to those of U.S. firms and the U.S. government. Cases will cover a range of economic sectors and countries. Students will be expected to work on an in-depth project.

MGT 3940 The Chief Executive Officer

Focuses upon the job perspective of the chief executive officer of business organizations. The central element of the course is presentations by and discussions with chief executives of major companies in the Greater Boston area. Additionally, there will be case studies and other literature addressing the job, problems, and opportunities of top managers. Enrollment will be limited. *Prereq.: 30 Q.H. of grad. credit.*

MGT 3942 Management Consulting

This course focuses on the skills, knowledge, and attitudes necessary for competence in the "art of consulting." The analytical, human, organizational, and administrative elements of consulting are discussed, as are the differences between internal and external consultants. In addition, the course examines management consulting as an industry and as a potential profession. This course is intended both for future consultants and for managers who will be using the services of professional consultants. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3956 Strategic Planning

This course covers approaches to strategic planning. Guided by a practitioner orientation, it will focus on the techniques, the process, and the organization of strategic planning. Case analyses of actual experiences will give emphasis to strategic planning as an activity to support mainstream strategic decision making and control, although other purposes of strategic planning also will be considered. The course is designed to be of very real and practical benefit to those wishing to develop skills in designing, implementing, evaluating, improving, and participating in strategic planning activities, as well as to those more generally desiring to develop further their "strategic thinking" capability.

MGT 3969 Government and Business

Analysis of the role of government as a regulating force, as well as the nature and impact of government fiscal, economic, and socioeconomic policies on the conduct of business. The political and economic philosophies behind greater government participation in the economic structure of the nation as indicated by public-utility, antitrust, labor, and socioeconomic legislation. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3970 Managing Social Issues

An analysis of environmental influences—economic, legal, technical, social, cultural, and ethical—affecting the corporation. The focus is on reconciling the strains generated by these external factors and their impact on managerial decision making. *Prereq.: HRM 3816 and 12 Q.H. of grad. credit.*

MGT 3975 Introduction to Health Care Systems

The present state of the system, dealing with its history and process, and describing the parts of the delivery system, the payers, the consumers, the manpower, and the policy implications. Includes comparison of health care systems, lectures, discussions, and readings. Recommended for those entering the field. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3976 Cases in Health Care Finance and Operations

Examines decision making in health organizations emphasizing financial considerations, the effect of government regulation, and third party reimbursement policies. Frequent case studies will be utilized to present financial statement analysis, financing decisions and resource allocation, including new program and facility development. Students will be expected to prepare cases and to take part in class discussions. *Prereq.: ACC 3812 and FIN 3811.*

MGT 3982 Strategic Planning for Health Organizations

This course examines the process of environmental and institutional analysis for strategic planning decisions in health institutions. The impact of these decisions on organizational design, competitive position, and health organization performance is considered through an examination of recent case studies. *Prereq.: MGT 3836.*

MGT 3983 Decision Making in a Hospital Setting: A Middle-Management Perspective

Operational problem solving with hospital constituencies (physicians, nurses, patients) is a demanding responsibility that encompasses legal, ethical, technological, and behavioral dimensions. The primary aim of the course is to demonstrate how decisions are made in the hospital and how management may effectively participate and shape the structure and outcome of decision-making processes. Case examples will cover such areas as "do not resuscitate orders," clinical decision making, physician and nursing power and authority, consensus development, and the like. The pragmatic practitioner orientation of the course will also incorporate experiential exercises and guest speakers. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3990 Business, Law, and Society I

An introduction to the theory and practice of the Anglo-American legal systems, with emphasis on the ways in which law, lawyers, and legal institutions interact with the business environment in order to promote and regulate commercial activities. After exploring some of the major social theories concerning the role of "law" in a market economy, we examine leading judicial decisions involving such key legal doctrines as freedom of contract, scope of property rights, and strict tort liability, with the objective of determining to what extent the Anglo-American legal system can accommodate the needs of a

modern commercial society and predicting likely directions of legal regulation of business. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3991 Legal Aspects of Business

This course provides an understanding of the American Legal System with an emphasis upon the resolution of corporate legal disputes by means of civil litigation, mediation, arbitration, and the corporate mini-trial. This course also examines the traditional areas of contract law and tort law as they relate to problems confronting the modern corporate manager. Students will scrutinize the legal structure of the corporation and focus upon agency issues, computer law, and the preservation of intellectual property. The course will conclude with a review of government regulation of business including anti-trust law and labor law.

MGT 3997 Special Studies in Business Administration 1 Q.H.

A special tutorial arrangement between a student and a faculty member for a guided reading, research, laboratory, fieldwork, report, or teaching experience. Recommended for graduate students who desire to do advanced work or carry out special investigation of a problem in business administration not specifically covered in the curriculum. Students must petition the Committee on Graduate Study in Business Administration for permission to register for this course. *Prereq.: 15 Q.H. of grad. credit.*

MGT 3998 Special Studies in Business Administration 2 Q.H.

See MGT 3997 for course description.

MGT 3999 Special Studies in Business Administration 3 Q.H.

See MGT 3997 for course description.

MKT 3301 Marketing

An organization's link to its market is a crucial aspect of the management process. This course begins with market analysis and market research and builds on the planning framework examining product, pricing, advertising, sales management and distribution. *For non-Business majors.*

MKT 3760 International Marketing

The purpose of this course is to help students develop understanding of: (1) the opportunities and challenges facing the international marketing executive; (2) the decision making process in marketing goods abroad; and (3) the environmental forces—economic, cultural and political—affecting the marketing process in the international marketplace. Lectures, discussions, reports, and cases. *Prereq.: MKT 3812.*

MKT 3811 Marketing Management I

The objectives of Marketing Management I and II are twofold: (1) to present the student with a comprehensive examination of basic marketing functions, institutions, and concepts; and (2) to help develop the student's ability to analyze and make recommendations about business problems that involve the creation, distribution, and sale of goods and ser-

vices. Marketing Management I emphasizes the definition of marketing problems, demand analysis, consumer analysis, and marketing research. *Prereq.: none.*

MKT 3812 Marketing Management II

A continuation of Marketing Management I, with emphasis on the formulation and implementation of marketing strategy. Emphasis is placed on product policy, channels of distribution, pricing, advertising, personal selling, and the development of integrated marketing programs of action. *Prereq.: MKT 3811.*

MKT 3914 Consumer Behavior

Offers development of an understanding of consumer attitudes and behavior processes. Various economic and behavioral models of consumer behavior are examined and evaluated as bases for the planning and evaluation of marketing strategies. The methods of instruction include text, readings, and project. *Prereq.: MKT 3812.*

MKT 3916 Workshop in Negotiating

Objective is to help improve the students' understanding of the negotiations process and their ability to plan and conduct negotiations effectively. Class activities involve readings, lectures, and discussions as well as numerous case discussions and live and videotaped role-play negotiation exercises. *Prereq.: MKT 3812 and HRM 3816.*

MKT 3920 Public Policy and Marketing

The purpose of this course is to acquaint students with the public policy environment in which marketing managers operate and to develop the skills necessary to function in that environment. More specifically, the course will address some of the regulatory and policy-making issues that confront managers in marketing. To that end, students will analyze current issues facing policy makers using the same materials the policy makers rely upon. Students will advocate various positions on these issues, both in class discussions and written assignments. *Prereq.: MKT 3811.*

MKT 3922 Brand Management

Emphasizes the process of new consumer product development, the management and development of product strategies, and management of the product mix in the multiproduct firm. Topics include identification and screening of new product opportunities, evaluation of product performance, segmenting the product market, diversification and simplification of the product line, and the management of innovation. *Prereq.: MKT 3812.*

MKT 3926 Advertising Management

Management of the advertising function from the perspective of users such as product managers. Case studies and text materials explore the role of advertising, target market identification, creative strategies, media planning, and advertising evaluation. Emphasis is placed upon the coordination of advertising with other elements of the marketing mix and overall corporate strategy. *Prereq.: MKT 3812.*

MKT 3931 Marketing Research

Major methods of marketing research are discussed. Emphasis is placed on research design issues—sampling, data collection procedures, and questionnaire construction—rather than on data-analysis procedures. Sources of error in surveys are also examined in detail, along with the appropriate methodological techniques designed to reduce their magnitude. Surveys are evaluated in terms of their ability to provide quality information. *Prereq.: MKT 3811 and MSC 3802.*

MKT 3932 Statistical Methods for Marketing Research

This course focuses on various statistical methods of design and analysis in marketing research. Among the topics discussed are nonparametric statistics, experimental design, correlation and regression analysis, multiple discriminant analysis, and factor analysis. Canned statistical programming routines will be used with actual survey data to illustrate the application of the methods discussed. This course may be taken independently of MKT 3931. *Prereq.: MKT 3811 and MSC 3802.*

MKT 3934 New Product Development

The importance of new products to the survival and prosperity of firms increases as product life cycles become shorter; as technology, competition, and consumer tastes change; and as operating costs increase. For most firms, coping with the problems of environmental change through modification of the product line is vital and difficult. This course will have as a primary concern the examination and analysis of some of the problems firms face in directing and managing their new product development activities. *Prereq.: MKT 3812.*

MKT 3936 Retail Management

This course analyzes the evolution of retail institutions and examines selected major strategy and policy problems of food, apparel, and general merchandise retailers. Cases and issues are explored from the viewpoint of the managements of supermarket, department store, specialty store, and discount enterprises. Designed primarily for students interested in retailing and those concerned about the role of mass distributors and the marketing of consumer goods. *Prereq.: MKT 3812.*

MKT 3940 Defense Marketing

This course will be conducted in a seminar format. Emphasis will be placed upon defense marketing in its totality, including analysis of participant roles, contractual foundations, contractor performance, and marketing activities. Topics include the overall defense acquisitions process, market characteristics, program management, procurement methods, sales and negotiation techniques, and related marketing management factors. *Prereq.: MKT 3812.*

MKT 3941 Industrial Marketing

The problems of industrial concerns in marketing products and services to industrial, business, and

organizational customers. Emphasis is placed on determining customers' needs and on developing programs to satisfy these needs. Topics include the roles and responsibilities of the marketing executive engaged in industrial distribution, advertising, and research, as well as roles and responsibilities of industrial salespeople, sales supervisors, and selling agents. *Prereq.: MKT 3812.*

MKT 3945 Sales Management

Designed to help develop the decision-making skills necessary to build and maintain an effective sales organization. Cases and readings are used to examine the strategic and operating problems of the sales manager. Major topics are: (1) the selling function, (2) sales management at the field level, (3) the sales executive, and (4) sales and marketing management. *Prereq.: MKT 3812.*

MKT 3966 Marketing in the Service Sector

Deals with public and private profit and nonprofit institutions which market services. Types of organizations covered include insurance, transportation, utilities, entertainment, health care, education, religious, sports, banking, artistic, and protective. Case discussions, textbooks, and outside readings are combined for a balanced approach for the development of marketing skills. Service characteristics are defined, classified, and analyzed from the perspective of their effect on marketing methods and institutions. *Prereq.: MKT 3812.*

MKT 3978 Competitive Strategy

This course is the capstone course for graduate students emphasizing the marketing area in their studies. The course pulls together into a cohesive whole the various functional, institutional, and strategic elements which comprise marketing and to which the student has been exposed in his previous course work. *Prereq.: MKT 3812.*

MKT 3980 Marketing Information and Decision Support Systems

This course is structured around the use of state-of-the-art information systems and computer-based decision aids in all areas of marketing management. It does not cover the traditional areas of marketing research. Hands-on experience with information systems and decision aids in the context of case studies is emphasized. *Prereq.: MKT 3811.*

MSC 3301 Operations

The strategic nature of operations planning. Capacity planning, quality control, product liability, production scheduling and control are stressed. The interdependence of sound financial planning, effective marketing strategies and corporate decision-making are highlighted. *For non-Business majors.*

MSC 3750 Competitive Decision Making

The objective of this course is to acquaint the student with problems of decision making in competitive and conflict situations—situations where the behavior of competitors or adversaries should effect

decisions. In addition to studying the basic theoretical results in the relevant fields, students will participate in numerous out-of-class negotiation exercises in which real competitive business situations are simulated. Through these exercises, students will have the opportunity to gain experience in making rapid, but calculated decisions in situations characterized by high degree of uncertainty and sophisticated competitors. *Prereq.: 15 Q.H. of grad. credit.*

MSC 3750 Competitive Decision Making

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MSC 3780 Operations Management in the Health Care System

Recommended for students whose career goals are positions of responsibility in the management of the health care system. Objectives are: (1) to help provide a basic understanding of operations management problems existing in the health care system; and (2) to develop decision-making ability to deal effectively with these problems. Topics include the fundamentals of management in the health care system, organizational planning, operations planning and control, utilization of resources, and policy considerations in effective and efficient operation of the health care system. Cases, readings, and field project. *Prereq.: MSC 3806.*

MSC 3802 Quantitative Analysis I

Examines the process of statistical inference, whereby the analyst is enabled to infer or draw conclusions about the parameters of a large data set on a basis of sample statistics. Other topics include the generation of subjective probabilities, the revision of probabilities to incorporate new information, and the incorporation of probabilities into the decision-making framework. *Prereq.: none.*

MSC 3803 Quantitative Analysis II

Introduction to the theory and practice of management science. Regression analysis, linear programming, and simulation are discussed in text and case material. Emphasis is on practical application of the techniques. Issues of problem definition, model building, relevant cost determination, solution generation, and implementation of results are considered. *Prereq.: MSC 3802.*

MSC 3805, Operations Management MSC 3806 I, II

The objectives of this two-course sequence are (1) to help develop an understanding of the management of operating systems, design, operation, control, evaluation, and modification; (2) to help increase the student's decision-making capabilities in technical areas; and (3) to help develop an appreciation for the operations manager's job. Topics include design of product and process, capacity planning, line balancing, work measurement, job evaluation, network scheduling, production planning, inventory management, production scheduling and control, and quality control. Operations Management I concentrates on the design of the operating system; Operations Management II focuses on its operation and control. *Prereq.: (for MSC 3806) MSC 3803.*

MSC 3832 Introduction to Computer Applications

A business-oriented introduction to data processing functions and systems. Introduction to the history, terminology, technology, and economics of data processing hardware and software. Management issues in the design, selection, evaluation, and use of computers and computer services. Individual familiarization with elementary computer programming by using personal computers to solve simple business-oriented exercises.

MSC 3909 Quality Planning and Analysis

Quality decisions take on strategic importance that must be addressed at all stages in the design and delivery of a product or service. This course analyzes the decisions that affect quality as a product passes through four distinct but interrelated stages: product design, process design, manufacturing, and sales-service. Course material emphasizes how decisions concerning quality influence the competitive position of an organization. Recommended for students who are interested in any phase of product (service) delivery, such as new product design, marketing, sales, manufacturing/operations, and strategic planning. Both text and case material will be used. *Prereq.: MSC 3806.*

MSC 3910 Decision Analysis

Decision analysis is a discipline for systematic evaluation of alternative actions. In selecting among alternative strategies, the decision maker must consider: (1) future events and subsequent actions that could exert a significant influence on the consequences of selecting a given strategy; (2) the likelihood of each such event occurring; (3) the consequence associated with the occurrence of each such event in conjunction with the action alternative being evaluated; and (4) the relative desirability of each consequence. The process for quantifying each of these and dealing with their interrelationships is examined within the unifying framework of the decision tree. *Prereq.: MSC 3802.*

MSC 3911 Manufacturing Policy

Focuses on strategic operating decisions typically addressed by the vice president of manufacturing operations, such as capacity expansion, the impact of new products and/or processes, product allocation to plants, and vertical integration. The emphasis will be on how these decisions impact the competitive position of a firm both now and in the future. This emphasis helps the students understand the totality of a top management situation where the interactions between corporate and manufacturing strategies are most evident. Learning materials include case studies, reference notes, and articles. Recommended for students who currently are in, or expect to be in, positions of major responsibility in manufacturing/operations, and also for students who must possess the qualifications to analyze the manufacturing capabilities of companies, such as those in investment banking, finance, and consulting. *Prereq.: MSC 3806.*

MSC 3912 Contemporary Issues in Manufacturing Management

This course considers recent significant developments in manufacturing technology and their managerial implications. The course objectives are to provide an understanding of modern manufacturing systems and their associated management problems, and to develop the decision-making ability necessary for the effective management of such systems. The topics covered include: automation, group technology, just-in-time production, and computer-integrated manufacturing. *Prereq.: MSC 3806.*

MSC 3913 Operations Management in the Service Sector

Traditional courses in operations management usually deal with manufacturing, because the concepts and techniques of operations management were originally developed in manufacturing settings. However, as the service and nonprofit sectors of the economy gain in importance, they have greater need for the types of tools and techniques which manufacturing uses. This course explores the applicability of operations management techniques in non-manufacturing environments. Industries covered include food service, health care, recreation, equipment rental, retailing, banking, insurance, government services, and airlines. *Prereq.: MSC 3806.*

MSC 3914 Performance Criteria and Incentive Systems

The first part of the course describes the issues and stages in implementing an effective performance criteria system—the backbone of a proper control system. Issues to be included are: planning and control, performance criteria, measurement of performance, and performance evaluation. The second part of the course concentrates on financial incentives used to increase motivation or improve performance. Issues to be included are: advantages and disadvantages of financial incentives, individual and group incentive systems, managers' incentives, and sales incentives.

MSC 3923 Computer Models for Management Decision Making

This course is designed to assist students in learning the use of the computer as a decision aid, rather than simply for data processing. The objectives are to enable students to recognize the features of various decision problems which make them candidates for computer modeling, to specify the design of appropriate management science models, and to realistically interpret the output from these models. Decision problems will be drawn primarily from the production, finance, and marketing areas. Topical coverage will be determined by the instructor and will be drawn from areas such as the following: simulation, linear programming, queuing theory, risk analysis, inventory models, portfolio theory, and Markov processes. Course material will include readings, cases, and lectures. Students will use the computer extensively in their case preparations. In some instances, "canned" computer programs will be provided; at other times students may be required to write their own models in languages such as BASIC or IFPS. *Prereq.: MSC 3832 and MSC 3803.*

MSC 3924 Applied Regression

This course consists of two general areas of topical coverage. The first area is the analysis of raw data for the purpose of identifying trends and relationships. The second segment concentrates on the application of data to the construction and evaluation of statistical models for the purpose of assisting in managerial decision-making. *Prereq.: MSC 3803.*

MSC 3928 Decision Support Systems

As the electronic data processing/management information systems field enters its second quarter century, a number of important changes are rapidly taking place: hardware prices are decreasing as power is increasing, software for decision support is finally maturing, and managers experienced in data processing techniques are rising higher in many organizations. This course is designed to acquaint the MBA candidate with current and future trends in decision support systems. Topical coverage will include: developments in hardware and software, decision support systems, high-level planning languages, and the politics and problems of systems implementation. Because this course is heavily directed toward issues of man-machine interaction and decision making, it is significantly narrower in scope than either MSC 3832 or MSC 3933. This course is usually conducted as a seminar, and registration is limited. Extensive classroom participation is required. Several years of full-time work experience is highly desirable, but not an absolute requirement. *Prereq.: MSC 3832 or MSC 3933.*

MSC 3929 Time-Series Forecasting

This course addresses forecasting problems of concern to decision makers with the firm. Specifically, the course entails short-run (weekly, monthly) forecasting using time-series methods such as regression, exponential smoothing, and other related tech-

niques. In addition, the course includes aggregate industry and national economic forecasting with longer time horizons. *Prereq.: MSC 3802 and MSC 3803.*

MSC 3930 Models in Operations Research

This course focuses on modeling for selected business applications using operations research/management science methodology. Emphasis will be on proper modeling and problem solving using readily available computer software. A few selected modeling techniques will be discussed in detail. *Prereq.: MSC 3802 and MSC 3803.*

MSC 3933 Management Information Systems

This course deals in depth with the analysis, design, implementation, and operation of modern management information systems. Case studies are utilized as the primary vehicle to illustrate all phases in the creation and management of computer-based systems. The emphasis of the course is on management issues rather than on computer technology or programming. This course is designed to follow MSC 3832. Thus, it is the logical second computer course that an MBA candidate might take. *Prereq.: MSC 3832.*

MSC 3934 High Technology Operations Management

High technology industries are usually characterized by greater degrees of innovation, faster rates of obsolescence of both products and capital equipment, and manufacturing operations at the early phases of the learning curve. These factors must be kept constantly in focus for efficient operations. This course discusses the importance of these factors, and the application of the tools and techniques of operations management to firms operating in a high technology environment. Recommended for students interested in careers in manufacturing in high technology industries, and also for those who would analyze the manufacturing capabilities of firms vis-à-vis technology, market and environment such as analysts for venture capitalists and consultants. *Prereq.: MSC 3806.*

MSC 3936 Data Base Management Systems

This course provides a management-oriented introduction to data base management systems (DBMS). Topical coverage will include: rationale for the DBMS approach, data base design, data models, DBMS software tools, conversion to a data base environment, and the role of the data base administrator. Students will be given the opportunity to use a DBMS package, gain experience in data base design, use a query language, and develop DBMS applications. *Prereq.: MSC 3832*

MSC 3937 Simulation and Modeling

This course presents the technique of computer simulation from a management perspective. The students will be given the opportunity to learn the fundamentals of programming and modeling discrete-event digital simulations. Methodological issues such

as types of simulation languages (including GPSS and SIMSCRIPT), random number generation, experimental design, and validation and verification will be considered. A survey of common simulation studies will be presented. The student will work on projects designed to provide experience in performing and evaluating various aspects of modern simulation studies. *Prereq.: MSC 3802 and MSC 3832.*

MSC 3938 Systems Analysis and Design

This course covers the systems analysis and design process from the point of view of both end user and systems analyst. Topical coverage will include the systems life cycle, the "traditional" systems analysis and design process, alternate strategies in implementing systems, the iterative nature of systems analysis and design, hardware and software evaluation and selection, and control of backlog. *Prereq.: MSC 3832.*

MSC 3939 Manufacturing Systems Software

The objective of this course is to provide the MBA student with an understanding of available manufacturing software. Upon completion of this course, the student should be prepared to participate in decision-making processes concerning manufacturing systems software. Topical coverage will include overview of manufacturing software, interfaces to other applications, micro/mini/mainframe tradeoffs, cost of operations, and control of system maintenance. *Prereq.: MSC 3832.*

MSC 3940 Data Communications for Managers

A non-technical introduction to data telecommunications to improve management knowledge in the many ways of handling data, both locally and remotely. Areas to be covered will include fiber optics, microwave, infrared, networking, and switching. Students will be given an opportunity to design a centralized computing system, a personal computer cluster, and, finally, the ability for the personal computers and the centralized computer to talk to each other. *Prereq.: MSC 3832.*

MSC 3941 Contemporary Issues in Manufacturing Management

This course considers recent significant developments in manufacturing technology and their managerial implications. The course objectives are to provide an understanding of modern manufacturing systems and their associated operations management problems, and to develop decision-making ability necessary for the effective management of such systems. The topics covered include: automation, group technology, just-in-time production and computer integrated manufacturing. The course involves lectures, readings, cases, and a field project. *Prereq.: MSC 3806.*

MSC 3960 Operations Planning and Control

This course examines the scheduling and control of resource allocations in operating systems. The systems range from high-volume assembly lines, to intermittent production systems to one-of-a-kind proj-

ects. Topics include: inventory planning and control, aggregate planning and master scheduling, materials requirements planning and network analyses. Both test and case materials are used. This course would be valuable to anyone interested in a career in operations management, industrial sales, purchasing, and consulting. *Prereq.: MSC 3806.*

TRN 3901 Transportation Policy and Regulation

This course examines the process by which national transportation policies are formulated. Attention is given to the existing regulatory structure and its impact on shippers and carriers. Existing policies and regulations are critiqued, with special emphasis given to such topics as the movement toward regulatory change in transportation. *Prereq.: none.*

TRN 3903 Corporate Transportation and Distribution Management

This course focuses on the design and management of corporate transportation and distribution systems. Emphasis is given to the analytical framework which is employed in making complex distribution trade-offs. Attention is devoted to topics such as inventory control, location analysis, transportation planning, and the integration of logistics planning with other functional aspects of the organization. *Prereq.: 15 Q.H. of grad. credit.*

Boston-Bouvé College of Human Development Professions

Graduate School of Boston-Bouvé College of Human Development Professions

All courses carry four quarter-hours of credit unless otherwise indicated. Please see the current schedule for summer, fall, winter, and spring quarter listings.

Counseling Psychology, Rehabilitation, and Special Education

CRS 3400 Alternatives for Mainstreaming Individuals with Special Needs

This course is for administrators, teachers, and specialists who are involved with mainstreaming individuals with special needs. Alternatives in decision making and program development, implementation, and evaluation may be explored with members of various disciplines who provide services for special needs children.

CRS 3401 Educating Individuals with Learning Disabilities

This course surveys behavioral and socio-emotional characteristics of individuals who manifest specific defects in perceptual, integrative, or expressive processes that impair learning. Current service delivery programs, individual learning styles, and related curriculum materials for elementary through high school-aged, learning-disabled students are also analyzed.

CRS 3404 Education of Individuals with Behavioral Disorders

A study of the various theories, programs, and approaches dealing with emotional disturbance. Emphasis on the role of the educator as it relates to the therapeutic management of individuals and groups displaying problems in socio-emotional development. Parent-teacher interaction is also discussed.

CRS 3405 Group Dynamics

Emphasis on understanding group growth, behavior, and action fundamental to developing solutions to the complex developing of group life. Students are given the opportunity to learn to examine their strengths and weaknesses, to examine group leadership styles, to become alert to new ideas and actions, to discover the pulse of a group, and to analyze reasons for one group's productivity and another's nonproductivity.

CRS 3407 Case Conferences: Individuals with Special Needs

This course is conducted as a seminar in connection with the student's practicum. Case presentations by outstanding resource persons are thoroughly examined and discussed. Students will also be expected to make their own case presentations to the seminar.

CRS 3408 Socio- and Psychodynamics of Family Life

Consideration is given to the internal and external dynamics of family life and the significance of such dynamics to the mental health of handicapped individuals and their families. Emphasis is on the impact of disability on family functioning and integration. Approaches to working with parents of special needs groups may be explored from psychodynamic, social learning, and systems viewpoints.

CRS 3410 Review of Current Methodology and Research in Learning Disorders

This advanced course is designed to help develop the following competencies in relation to educating learning-disordered individuals (early childhood through adulthood): use of task analysis and learning style to develop comprehensive individual education plans; use of current research to evaluate techniques of intervention (e.g., behavior modification and drug therapy for hyperactive children); review of current research to evaluate assessment techniques (e.g., effectiveness of available tests for learning disorders; ability to administer, score, and interpret tests useful in identifying learning disabilities; use of prescriptive techniques and materials for learning disabilities). Selection of topics within competency areas may be individualized for students, based on previous course work and experience. *Prereq.: CRS 3401 Educating individuals with Learning Disabilities.*

CRS 3412 Psychology of Individuals with Special Needs

A study of the social and emotional adjustment of the handicapped and of the psychological significance of mental, sensory, and motor variations. The effects of limitations imposed by attitudes of society, the attitudes of individuals toward their handicaps, and the effect of the handicap itself are evaluated. Implications for educational programs are analyzed. (This course should be among the first taken in the Special Education sequence.)

CRS 3415 Assessment in Special Education

This field-based course offers students the opportunity to learn to administer selected norm-referenced tests for special needs populations, determine which

tests will yield the most information in a variety of case studies, and interpret data obtained from a minimum of four norm-referenced test batteries.

CRS 3416 Diagnostic Prescriptive Teaching

Course instruction in this field-based course focuses on the following broad areas: development and implementation of individualized educational plans, including tasks analysis, annual goals, and short-range objectives; educational strategies and their application in classroom management; adaptation and selection of materials and strategies in various academic areas; perceptual-motor skills; and social-emotional interventions.

CRS 3417 Early Childhood Learning Problems: Identification and Program Development

Informal and formal screening and assessment procedures suitable for an early childhood population are evaluated. Students will be required to work with young children in order to acquire experience with screening and assessment techniques. The resulting information may then be used to develop programs to meet the needs of individual children.

CRS 3418 Special Education for Gifted Children

Identification, characteristics, and problems of gifted, creative, and talented children and youth. Emphasis on administrative and instructional adjustments needed to provide for this group of exceptional children.

CRS 3419 Fieldwork and Seminar with Special Needs Children

CRS 3420 Student Teaching and Seminar with Special Needs Children 4 Q.H. each

The courses are scheduled to extend over a full year in a series of experiences as observer, tutor, and teacher. Students must make available approximately 250 hours or two days per week for two quarters for fieldwork, then approximately another 250 hours or four days per week for one quarter for student teaching. Students who are employed and who cannot devote full days to satisfy these requirements must arrange to be available evenings, weekends, and summers. Provision for attendance at biweekly seminars must also be made. Seminars are for the purpose of discussing with other students and professors the relevant issues confronted by teachers of special needs children. Outside speakers and programs may be arranged to extend this dialogue. The adviser's written approval will be required before the student can do field placement or student teaching. The adviser's written approval is also required before students can obtain a waiver of student teaching. All students, regardless of past experience, certifications, or letters of approval, are expected to do approximately 250 hours of fieldwork, set up and supervised by the University.

CRS 3424, 3425 Etiology and Development of Special Needs 8 Q.H.

The first quarter (CRS 3424) concentrates on factors which primarily affect deviations in cognitive, motoric,

and physical development. Understanding of these factors will be used to discuss multi-disciplinary life-management issues relating to Down's Syndrome, cerebral palsy, and other common conditions.

The second quarter (CRS 3425) concentrates on factors which primarily affect emotional development. Psychobiological, psychodynamic, and learning theory approaches may be discussed and related to problems of lifespan management. Community programs in addition to the more traditional intervention techniques are analyzed.

CRS 3426 Seminar in Mental Retardation

A study of research in the field and its implications for teaching. Intervention strategies are studied and evaluated.

CRS 3427 Seminar: Neuropsychology of Learning and Behavior Disorders

Through critical review of the literature, varied neuropsychological interpretations of the nature of learning and behavior disorders are analyzed and discussed. Topics related to the function of the brain and its relationship to behavior include biochemical and physiological correlates, cognitive and perceptual factors, genetic and maturational variables, hemispheric specialization, and implications of drug studies. Implications of the above for educating and serving special needs individuals are useful to administrators, teachers, counselors, reading specialists, school psychologists, and those in allied health fields. Students will be expected to give a presentation in an area of interest related to the seminar topic. *Prereq.: CRS 3401 Educating Individuals with Learning Disabilities.*

CRS 3428 The Severely Handicapped

A review of handicapping conditions and consideration of the implications of severe multiple handicaps. Students will develop a case study of a severely handicapped person in conjunction with a review of relevant literature.

CRS 3429 Development and Implementation of Programs for the Severely Handicapped

Course work includes observation of severely handicapped persons in the classroom and community; demonstration of evaluation and assessment techniques; and analysis of developmental, educational, and rehabilitation plans for severely handicapped persons.

CRS 3433 Introduction to Rehabilitation

An overview of an orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasis is placed on coordinating and integrating services as they related to the field of rehabilitation as a community process.

CRS 3434 Principles of Medical Rehabilitation

The wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. The course may also present basic principles of medical

rehabilitation that administrators should know. Psychological aspects of disability also discussed.

CRS 3435 Program Development in Rehabilitation

This course deals with the use of the rehabilitation model in program development for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, culturally disadvantaged, and other special community groups. Emphasizes the administrative involvement in developing and supporting the diagnostic, evaluative, counseling, and placement procedures used in such rehabilitative programs. Issues involving clinical program planning may be explored.

CRS 3436 Organization and Administrative Theory

The body of conceptual knowledge regarding organizational and administrative theory will be examined. Formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision making, and communication in and between organizations. An organizational analysis will be made of all the different types of rehabilitation settings currently in use.

CRS 3437 Community Planning in Rehabilitation

What administrators need to know about community planning to develop programs in their areas. Basic principles of community planning, organization, and dynamics, as well as interdisciplinary relations in rehabilitation. Examples of community planning from different rehabilitation agencies and the referral process among these agencies will be studied.

CRS 3439 Social Welfare and Rehabilitation

This course attempts to acquaint administrators, counselors, and other human services personnel with the broad field of social welfare. The course reviews the historical background of the relationship between vocational rehabilitation and social welfare and the more recent developments in the relationship of these fields.

CRS 3440 Program Evaluation in Rehabilitation

The emphasis in this course will be on administrative research, program evaluation, grantsmanship, etc. In addition, students will have the opportunity to develop a research design on some aspect of rehabilitation administration and carry out the necessary research operations involved.

CRS 3442 Fiscal Policy and Management I

An introduction to the concept of fiscal and managerial control. Areas to be covered may include accounting and budgetary procedures, need surveys, goal-setting practices, recruitment, staffing, training, professional development, caseload management, program planning, utilization of research, leadership patterns, performance appraisal, and external relationships. Case method approach may be used in classroom exercises.

CRS 3443 Administration of a Sheltered Workshop

Special problems of administering a sheltered workshop, such as community planning, work evaluation, job training, labor relations, contracting, production, and occupational placement.

CRS 3444 Fiscal Policy and Management II

Understanding the fiscal management of the typical rehabilitation setting, including basic rehabilitation agency accounting, planned program budgeting, disbursements, cost analysis, contracting, taxation, forecasting, and funding. The implication of data processing for fiscal management is covered in the course. Special problems will be assigned during the course.

CRS 3445 Legal Aspects of Rehabilitation and Special Education

This course is designed to sensitize rehabilitation administrators, special educators, rehabilitation counselors, and other personnel to the impact of legislative developments upon the field of rehabilitation and special education. Special emphasis is placed on understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments. Latest federal and state special education legislation is covered.

CRS 3446 Occupational Placement

A study of the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. The personnel point of view of the handicapped individual is discussed and analyzed, and more effective placement practices developed.

CRS 3449 Psychological Problems of Disability

An advanced course in psychopathology as it relates to the impact of disability on personality. In-depth study of the moderately and severely handicapped from the viewpoint of psychosocial factors, interpersonal relationships, and cognitive versus noncognitive functioning in those with motor and sensory disabilities, problems of dependency and motivation; role of psychosomatic factors. Some discussion of the role of treatment and rehabilitation.

CRS 3450 Administrative Problems in Rehabilitation

Seminar designed to analyze, in depth, critical issues and selected rehabilitation problems. Operations and systems research as applied to rehabilitation will be highlighted. Students are offered the use of institute research studies and studies available through social and rehabilitation services, completed research, and demonstrative projects.

CRS 3451 Essentials of Case Management and Supervision

The relationship between case management and casework supervision. Topics are the dynamics of the communication process, decision making, conflict, resolution and compliance, management of resources external to the organization, structural and functional analysis of supervisory process, and case-load management.

CRS 3452 Rehabilitation of the Alcoholic and Drug Dependent

A study of comprehensive factors, including the nature of etiology dynamics involved in alcohol and drug dependency; techniques for evaluation; rehabilitation administration, planning, and treatment.

CRS 3453 Rehabilitation of the Penal Offender

The rehabilitation of the penal offender is examined from an eclectic point of view. Psychodynamic elements are stressed, as well as social factors in the etiology, evaluation, and treatment and rehabilitation seminar planning and administration.

CRS 3454 Rehabilitation of the Geriatric

This course presents a comprehensive treatment of the problems, dimensions, and parameters involved in the administration of the various services and facilities for the rehabilitation of the geriatric. Special emphasis is on the philosophy of rehabilitation versus disengagement.

CRS 3455 Critical Issues in Rehabilitation Administration

This course is built around the exploration and indepth discussion of current issues which are highly problematical to the field. Among these issues are the breadth of the concept of disability, appropriate training sequences for the various rehabilitation disciplines, resolution of conflict over role overlap among disciplines, appropriate models for service delivery systems. The most current and relevant research may be brought to bear upon these areas, as well as knowledge from the reservoir of experience of instructors, visiting experts, and the student participants themselves. Students will be exposed to the issues as they exist in the profession and in the community. A theoretically oriented frame of reference will be brought to bear upon problems when feasible.

**CRS 3460 (2 Q.H.), 3461 (3 Q.H.), 3462 (3 Q.H.)
Rehabilitation Administration Practicum I, II, and III**
**CRS 3463 (2 Q.H.), 3464 (3 Q.H.), 3465 (3 Q.H.)
Rehabilitation Counseling Practicum I, II, and III**

Students are usually assigned to a variety of rehabilitation agencies for their practicum experience. Problem solving relevant to experiences encountered in internship. A seminar may be regularly conducted by a senior faculty member in conjunction with the practicum experience. This seminar offers students an opportunity to share their fieldwork experiences and resolve problems in rehabilitation which are connected with their field placements.

CRS 3477 Evaluation of Deaf Rehabilitation Clients

Methods and techniques of psychological and vocational evaluation for deaf rehabilitation clients, including evaluation of client biographical characteristics, evaluation interview, and psychometric assessment. Required of all students in Deafness specialization of Rehabilitation Counseling program. *Prereq.: CRS 3501 Psychological Testing and SLA 3644 Foundations of Deaf Education.*

CRS 3500 Foundations in Professional Psychology and Human Services

The purpose of this course is to provide a philosophical and theoretical background for beginning graduate students in counseling. The course has three objectives: 1) to sharpen the "self as instrument" through study and discussion of established theories of helping related to one's personal value system and through self-exploration and increased self-understanding in heretofore unexplored personal areas; 2) to introduce students to the broad spectrum of professional helping service areas with the intent of clarifying the students' professional roles; and 3) to begin to promote the development of a professional identity as a psychological helping professional.

CRS 3501 Psychological Testing

The principles and problems of psychological testing as applied to the work of the counselor are discussed. Consideration is given to technical concepts applicable to the use, understanding, and interpretation of test scores. Students have the opportunity to become familiar with the most frequently used tests of intelligence, aptitude, achievement, interest, and personality. Tests are evaluated for use in diagnosis and in understanding human behavior, with emphasis on their interpretation.

CRS 3502 Vocational Development and Occupational Information

A dual-emphasis course dealing, first, with theories about the ways in which individuals make decisions concerning their choice of vocation; and second, with the kind of data which are needed to assist people with these decisions. These requisite data deal with the relationship of social and economic change to occupational trends, the classification and description of occupational fields, methods of collecting, evaluating, filing, and disseminating vocational information, and the role of the counselor in fulfilling these functions.

CRS 3503 Counseling Theory and Process

A course which normally is taken in the fall quarter, concurrently with the beginning of Practicum. The course will provide the student with a basic cognitive understanding of several major theoretical approaches to counseling. Classroom content will help students to become familiar with a wide range of individual counseling strategies, to develop listening, understanding, and communications skills, and to further probe their own self-understanding as coun-

selors. These skills and understandings will be discussed and simulated in the context of a variety of settings with a variety of clients. Role playing, case material, and audio and video materials will be utilized in the instruction. During fall quarter this course is open only to departmental degree majors. It is open to degree and nondegree students with permission of the instructor during winter and spring quarters.

CRS 3507 Group Counseling

An introduction to theory, principles, and techniques of counseling with groups of individuals at different levels of development and for varying purposes. A basic mode of approach may be to involve students in a genuine group counseling experience in order to understand the phenomenon of group experience. *Prereq.: CRS 3503 Counseling Theory and Process.*

CRS 3508 The College Student and the Campus

The relationship between college students' behavior and their environment is examined, with focus on students' rights, their social-emotional developmental concerns, and their search for identity. The impact of societal forces and nontraditional patterns of learning on college curriculum options is examined, and varying concerns of personnel services in different types of college climates, including the community college, are discussed. Current issues in higher education are examined as they relate to services offered to students.

CRS 3517 Consultation Seminar

Offers a review of various consultation models, including behavioral consultation, process consultation, and systems consultation. Study also examines current research in the field of counseling consultation. Particular emphasis is placed on the development of a personal consultation style and enhancement of consultation skills.

CRS 3525 Family and Parent Counseling

The focus of this course is on a conceptual understanding of family systems theory and its application to and implications for family counseling. Structural, communicative, and strategic approaches to marital, parent, and family counseling are presented as the family is studied as an interactional system, as a seedbed of distress and health. Students have the opportunity to become familiar with family assessment, counseling skills, and strategies. *Prereq.: CRS 3503 Counseling Theory and Process.*

CRS 3526 Seminar in Student Personnel Work

Based on case simulation and role plays, students will explore the legal, philosophical, and management theory bases for decision-making in the process of developing and administering student personnel programs in higher education. The emphasis is on translating theory into practice via lectures, discussions, and the analysis of case study materials.

CRS 3527 Counseling Strategies for Children and Adolescents

Intended primarily for students who will counsel in school settings or other settings emphasizing work with children and adolescents. A broad range of approaches will be considered, including, but not limited to behavior modification, Adlerian, and Reality Therapy strategies. Special emphasis will be placed on the development of strategies designed to help alleviate typical school-related and developmental problems such as nonachievement, decision making, negative self-identity, and disruptive behavior. Consideration will also be given to the counselor's role as a consultant to teachers, parents, and administrators in effecting positive behavior change. *Prereq.: CRS 3503 Counseling Theory and Process.*

CRS 3528 Vocational Counseling Strategies

The individual's role expectations in the world of work will be examined from a human development perspective, and a systematic program to foster self-awareness will be set forth. Vocational counseling is viewed as dealing with the entire individual, including his or her values, underlying psychological needs and drives, and the influence of the environment on his or her level of development and career awareness. Other topics to be developed in this course will include counseling with females and nonachievers, the decline of the work ethic, community resource development, job placement, and information giving as a perceptual process. The course is intended for a variety of client populations from adolescence through adulthood. *Prereq.: CRS 3503 Counseling Theory and Process.*

CRS 3529 Rehabilitation Counseling Strategies

Primary emphasis will be on the roles and functions of the rehabilitation counselor, relevant issues in the field, and an overview of the rehabilitation process. Special problems and techniques of counseling with the disabled (physical, mental, and behavioral disorders) will be examined through case studies and role playing. Discussion will also cover disability in the context of social deviance and psychosocial approaches to understanding human behavior, including self-concept, social role theories, and rational-behavioral approaches. *Prereq.: CRS 3503 Counseling Theory and Process. (This prerequisite is waived for Rehabilitation Administration majors.)*

CRS 3530 Psychological Counseling Strategies

Focuses on a variety of strategies designed to alleviate problems of older adolescents and adults. Developmental and perceptual Gestalt insight approaches and behavioral approaches to counseling will be analyzed for their effectiveness with a variety of psychological problems. This course is primarily intended for the student working with client populations in mental health settings and college counseling centers. *Prereq.: CRS 3503 Counseling Theory and Process.*

CRS 3531 Case Studies in Marriage and Family Counseling

An advanced-level course for students with previous experience or preparation in marriage and family counseling. Skills to be emphasized may include 1) the preparation of case studies of family and marriage histories and current functioning; 2) the design of service, counseling, and referral programs based upon comprehensive studies of needs and resources; and 3) the practice of counseling strategies through role playing, taped interviews, and progress reports of current counseling activities. *Prereq.: CRS 3525 Family and Parent Counseling.*

CRS 3532 Seminar in School Psychology

This course provides an intensive analysis of philosophical, technical, and school administrative issues contributing to the professional identity and consultative function of the psychologist in an educational milieu. Simulations, case studies, and research projects will be used to study these issues. *Prereq.: Permission of instructor.*

CRS 3533 Psychoeducational Prescriptions

Recommended for all school counseling majors and required of all school psychology majors, this course will provide training and supervision in synthesizing data on a student's cognitive, affective, and interpersonal needs with educational plans which 1) are based directly on that data, 2) may be implemented in the school setting, and 3) meet the 766, PL 94-142 criteria for such plans. *Prereq.: Permission of instructor.*

CRS 3534 Individual Intelligence Testing 6 Q.H.

Preparation to administer, score, and interpret the Stanford-Binet Intelligence Test, the Wechsler Adult Intelligence Test, and the Wechsler Intelligence Scale for Children. Consideration will be given to the theories of intelligence upon which the tests are based and the use of the tests in educational and clinical settings. Students will be required to administer and score thirty tests, including some from each of the three tests included in the course. *Prereq.: CRS 3501 Psychological Testing.*

CRS 3535 Seminar in Contemporary Issues in Counseling

Intensive study of a selected topic in counseling such as counseling minorities, current research, sex counseling, transactional analysis theory and practice, and behavioral counseling. Course objectives will vary according to the topic but may include a review of the literature, skill building workshop, and action projects. *Prereq.: CRS 3538 Advanced Theories of Behavior Change I and/or permission of instructor.*

CRS 3536 Advanced Group Counseling

This course will be a continuation of the content presented in Group Counseling, placing greater emphasis on developing skill in conducting group counseling at a variety of age levels. Greater attention will be given to relevant readings and research on group

process and methods for behavior modification. *Prereq.: CRS 3507 Group Counseling.*

CRS 3537 Seminar in Counseling Supervision and In-Service Education

Theory and practice of the supervisory process as it applies to the evaluation of counselor effectiveness and professional development. Theory readings, discussions, role playing, and plans for in-service staff development are course requirements, but the major activity of the course involves the use of audio and videotapes of actual supervisory sessions conducted by class members. *Prereq.: Master's degree in guidance or permission of the instructor.*

CRS 3538 Advanced Theories of Behavior Change I

An advanced-level counseling course required of all CAGS students and designed to provide greater depth of cognitive understanding of three major approaches to therapeutic practice, i.e., the behavioral, depth psychological, and general systems viewpoints. Original readings from selected principal theorists will be required. The course will compare assumptions, goals, and strategies of the theorists studied in order to build a strong conceptual basis for a counseling eclecticism from these analyses. Some of the theorists studied may include Skinner, Wolpe, Bandura, von Bertalanffy, Adler, Jung, and Rank. *Prereq.: At least two counseling courses emphasizing both theory and process.*

CRS 3539 Advanced Theories of Behavior Change II

This course addresses the fundamental methods for constructively improving human behavior, as implicit within the three generic approaches to psychological theory construction, and provides an overview of Ludwig von Bertalanffy's general systems concept of psychology and its relations to allied sciences. The course is based on a format of selected readings, lectures, and student discussion. *Prereq.: CRS 3538 Advanced Theories of Behavior Change I.*

CRS 3540 Advanced Psychodiagnostics

This is an advanced-level course providing intensive supervision in the clinical assessment of ego functioning in children and adolescents. A rudimentary knowledge of the theory and practice of psychodiagnostics is assumed. This course will enable students to receive supervision on clinical evaluations on which they are working. A heavy emphasis will be placed on integrating data from a variety of sources and making in-depth interpretations and appropriate recommendations.

CRS 3541 Psychodiagnostic Measures

This is an advanced-level course in the clinical assessment of adults. The course places heavy emphasis on differential diagnosis and personality description using data from a variety of sources—interviewing, case histories, and objective and projective testing. Some of the tests typically studied in this course may include the California Psychological Inventory, Minnesota Multiphasic Personality

Inventory, Bender-Gestalt and Sentence Completion Tests, Wechsler Adult Intelligence Scale, and Draw-A-Person Test. Students will be required to administer and interpret psychological test data and to report their findings in a psychological report. *Prereq.: CRS 3501 Psychological Testing and CRS 3534 Individual Intelligence Testing.*

CRS 3550 Philosophy of the Behavioral Sciences

Addresses such fundamental questions as "What is science? What are its essential methods of inquiry, particularly as they pertain to the behavioral sciences? What is the nature of knowledge gained through scientific investigation, and are there limits to its usefulness?" Participants have the opportunity to examine the natural and empirical sciences through exploring theory, fact propositions, hypothetical deductive/inductive knowledge, laws, evidence, verification, reductionism, and allied ideas. *Prereq.: ED 3342 Research Design in Education and CRS 3539 Advanced Theories of Behavior Change II.*

CRS 3551 Legal, Ethical, and Professional Issues in Counseling and Mental Health

Provides a systematic orientation to the moral, legal, ethical, and professional issues found by mental health practitioners in their teaching, research, and practice. *Prereq.: Doctoral standing or permission of instructor.*

CRS 3560 (2 Q.H.), 3561 (3 Q.H.), 3562 (3 Q.H.)

Counseling Psychology Practicum I, II, and III

CRS 3563 (2 Q.H.), 3564 (3 Q.H.), 3565 (3 Q.H.)

Industrial Practicum I, II, and III

CRS 3566 (2 Q.H.), 3567 (3 Q.H.), 3568 (3 Q.H.)

School Counseling Practicum I, II, and III

CRS 3569 (2 Q.H.), 3570 (3 Q.H.), 3571 (3 Q.H.)

Student Personnel Practicum I, II, and III

The counseling practicum is a supervised counseling experience extended over the academic year. Emphasis in the fall will be on small group seminars dealing with counseling and other related matters. The winter and spring quarters will concentrate on the supervised counseling assignment. Assignment to practicum settings will be made according to the student's major area of concentration. Students must make themselves available a minimum of two days per week during the academic year (October to June) for placement in a field setting. Seminars will stress materials germane to the student's major and will meet a total of twenty-four times during the year. Each practicum must be successfully completed prior to commencing the next. *Part-time students must submit an application for practicum (available from the department) by April 1, for approval to enroll in the practicum the following fall quarter. Prereq.: CRS 3500 and CRS 3503 (both may be taken concurrently with the beginning of practicum).*

CRS 3575 (2 Q.H.), 3576 (3 Q.H.), 3577 (3 Q.H.)

School Psychology Fieldwork I, II, and III

The first phase of a two-year sequence of supervised fieldwork required for school psychologist

certification. Students are assigned a placement in an N-12 school system working under the supervision of a certified school psychologist. The activity of the fieldwork will extend for two days a week across the academic year from September to June. Students perform psychological evaluations and participate in other appropriate activities. Seminars meet for twenty-four sessions during the year to provide skill training and discuss role functions. Students receive one hour of supervision per week from the field site supervisor. *Students must submit an application for a fieldwork placement by April 1 for approval for the course which begins in the following fall quarter. Prereq.: Approval of adviser.*

CRS 3578 (2 Q.H.), 3579 (3 Q.H.), 3580 (3 Q.H.)

School Psychology Fieldwork IV, V, and VI

The second phase of a two-year sequence leading to eligibility for application for school psychologist certification. The student will be assigned typically to a different N-12 grade placement from the first experience to provide a diversified experience. The placement is for two days per week from September to June. Seminars meet twenty-four times across the academic year and consist of case presentations, skill and strategy training, and discussions of case management. Students work under and receive one hour of supervision from their certified school psychologist site supervisor. *Students must submit an application for fieldwork by April 1 for approval to enroll in the fieldwork course the following fall quarter. Prereq.: CRS 3575-3576-3577.*

CRS 3581 (2 Q.H.), 3582 (3 Q.H.), 3583 (3 Q.H.)

Advanced Fieldwork I, II, and III

Required for all CAGS students. Students may be assigned a fieldwork placement consistent with their major professional goals and/or the settings in which they intend to work. The activity of the fieldwork may extend across the academic year from September to June and require a minimum of one and a half days per week, or the equivalent, in the fieldwork setting. Seminars will meet, subject to change, on alternate weeks with additional individual supervision on campus. Supervision will also be provided in the field setting. All quarters must be completed before credit will be given for the course. *Prereq.: Counseling practicum or equivalent in experience.*

CRS 3800 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Not available to special students. Prereq.: Approval of the chairperson of the department and of the director of the graduate school. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

CRS 3801 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

CRS 3803 Institute in Counselor Education

(See general institute description on page 00.)

CRS 3804 Institute in Rehabilitation Administration

(See general institute description on page 00.)

CRS 3805 Institute in Special Education

(See general institute description on page 00.)

CRS 3806 Workshop in Counselor Education

(See general workshop description on page 00.)

CRS 3807 Workshop in Rehabilitation Administration

(See general workshop description on page 00.)

CRS 3808 Doctoral Dissertation

Prereq.: Admission to candidacy in the Doctor of Education degree program.

**CRS 3850, 3851, 3852, 3853, 3854, 3855
(2 Q.H. each for a total of 12 Q.H.)**

Required of all doctoral students in counseling psychology. Field placement is determined by Internship Committee based upon individual professional goals and experience. The activity requires a mini-

mum of 20 hours per week for 18 months for a total of 1500 clock hours in the internship setting. Students will register for CRS 3850 through CRS 3855 for a total of 12 quarter hours. Campus meetings will be held at least eight times a quarter on a group basis for all interns. On-site supervision will be provided for at least two hours per week on an individual basis. *Prereq.: Advanced Fieldwork or the equivalent in experience approved by the Internship Committee.*

CRS 3856, 3857, 3858

(4 Q.H. each for a total of 12 Q.H.)

Internship in Counseling Psychology I-III

Required of all doctoral students in counseling psychology. Field placement is determined by Internship Committee based upon individual professional goals and experience. The activity requires a minimum of 40 hours per week for nine months for a total of 1500 clock hours in the internship setting. Students will register for CRS 3856 through CRS 3858 in subsequent quarters for a total of 12 quarter hours. Campus meetings will be held at least eight times a quarter on a group basis for all interns. On-site supervision will be provided by the field supervisor for at least two hours per week on an individual basis. *Prereq.: Advanced Fieldwork or the equivalent in experience approved by the Internship Committee.*

Education

ED 3300 Psychology of Learning

The basic principles and conditions of acquisition, retention, and transfer of learning. *Suggested prereq.: A course in psychology.*

ED 3301 Psychology of Thinking

A consideration of the processes involved in cognitive organization and functioning. Topics will include language, concept formation, and problem solving. *Suggested prereq.: A course in psychology.*

ED 3302 Psychology of Personality

A systematic consideration of the personality theories of Freud, Jung, Adler, Sullivan, Horney, Cattell, Allport, Rogers, and other approaches, including the psychosomatic of Alexander and the work of Reich. Theories are considered in depth and examined for ways that contribute to an understanding of dynamic factors in personality formation. Theories and theorists are compared for a greater understanding of strengths and weaknesses. Social, cultural and philosophic questions are discussed. Implications of some of the ideas and theories for the therapeutic process will also be considered. *Suggested prereq.: At least one and preferably more courses in psychology.*

ED 3303 Theories of Developmental Psychology

The major developmental theories and related research of Havighurst, Erickson, Piaget, and others. *Permission of instructor required.*

ED 3304 Child Psychology

A review of the principles of child development from birth to preadolescence. Particular emphasis will be placed on intellectual, social, and emotional development. The theoretical formulations of psychoanalysis, social learning theory, and Piaget will be discussed in the context of relevant research in these areas, as well as their educational implications.

ED 3305 Adolescent Psychology

Social, emotional, and intellectual development in the adolescent years. Problems in family relationships and in the adolescent's social environment as well as his adjustment in school. Case history material.

ED 3306 Abnormal Psychology

An historical overview leads to contemporary views on how human personality becomes disordered and maladaptive. Principal emphasis is on the development of psychopathology during the course of development, including a perspective for viewing the economy of psychological deviations. Neuroses, transient states, character disorders, sexual deviations, psychophysiological reactions, drug and alcohol addictions, and psychotic reactions, each with a clinical picture, typical course, and outcomes are considered. Some consideration is devoted to current methods of diagnosis and treatment.

ED 3307 Adult Psychology

A comprehensive view of the three major areas of adulthood (young adulthood, middle age, and old age) in a context of research findings, academic knowledge, and clinical needs.

ED 3308 Seminar in Child Development

A seminar course with emphasis on discussion of child development theories with special reference to personality and cognitive development. Critical evaluation of research related to child development theories with particular emphasis on recent trends, new approaches, and relevance to educational theories and practices. *Prereq.: A course in child psychology or human development.*

ED 3309 Seminar in Adolescent Development

A seminar course with emphasis on discussion of major problem areas facing the adolescent in our society. Particular emphasis will be given to social and emotional development. Included will be a survey of research in such areas as psychoanalysis, social learning, morality, and delinquency. *Prereq.: A course in adolescent psychology or human development.*

ED 3310 Personality and Social Structure

Human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. The integration of relevant theories from psychology, sociology, and anthropology. *Suggested prereq.: A course in sociology, cultural anthropology, or social psychology.*

ED 3311 Sex Roles in Education

This course identifies and examines some of the major issues related to sex roles in both the formal and informal educational systems of our society. Topics that will come under special scrutiny include development of sex role patterns in the home and preschool and through children's books, games, and television programs; life for boys and girls in the elementary and high school classroom; sex bias in counseling and in vocational guidance and training; changes in traditional family roles and occupation hierarchies; assets and liabilities of coeducational and single-sex education. The course may also allow students, in small groups, to explore their own sex role attitudes and the strategies they use to socialize young people.

ED 3312 Communications Theory

An introduction to communications theory, covering models of the communication process, attitude changes, information, innovation, dissemination and flow, communication modalities, and language processing.

ED 3320 Sociology of Education

The functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives: the

school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise.

ED 3321 Educational Anthropology

Examination of schooling as a particular variety of socialization, with special attention to characteristics of societies that rely heavily on formal instruction, contrasted with less deliberately patterned techniques of child rearing. Readings will be mainly cross-cultural, ethnographic, and historical.

ED 3324 Comparative Education

Introduction to education in other nations and exploration of its relationships with the political, economic, social, and cultural milieu. Selected countries in Western and Eastern Europe, South America, and Africa will be considered.

ED 3325 History of Education

An opportunity to explore some of the historical roots of contemporary educational theory and practice with a focus on selected aspects of educational history from antiquity to the present. Also an opportunity to utilize knowledge gained for the development of a personal educational position.

ED 3326 Topics in the Philosophy of Education

A study of the basic assumptions underlying statements of educational content, process, and aims. Materials to be subjected to philosophical analysis are selected from educational and philosophic writings according to themes (e.g., authority and freedom, "growth" as an educational objective, the nature of educational relationships). The themes dealt with vary from quarter to quarter, depending on the concerns and interests of students and instructor. Brief lectures, mostly discussion.

ED 3327 Seminar in Contemporary Issues in American Education

Discussion of selected issues in contemporary American education such as school desegregation, compensatory education, learning problems of the disadvantaged, professionalization of teachers, etc. Review of relevant research and opinions. The topic or topics of the seminar for a particular quarter will be announced in the registration materials distributed in advance of that quarter.

ED 3328 Education and Equality

An investigation into the reciprocal relationship between American educational institutions and the equality-inequality dimension of American social structure. Both the traditional view, which celebrates the American public school as a triumph of equalitarianism, and the revisionist view, which emphasizes inequalitarian consequences of American educational practice, will be discussed.

ED 3340 Introduction to Educational Statistics

Basic descriptive statistics for measurement and research. Topics include use of statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distributions, linear regression and correlation, and an

introduction to statistical inference. (This course, or completion of a statistics proficiency examination, is required for admission to ED 3342 Research Design in Education.)

ED 3341 Intermediate Educational Statistics

Statistical inference of normal populations and discrete data; estimation; testing of hypotheses; multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other nonparametric tests. Emphasis is given to application in educational research. *Prereq.: Successful completion of the statistics proficiency examination; satisfactory completion of ED 3340 Introduction to Educational Statistics; or permission of instructor.* This course must be completed prior to doctoral candidacy.

ED 3342 Research Design in Education

An introduction to scientific methods of research in education and related fields. Stress will be placed on critical reading and understanding of research literature, formulating research hypotheses, constructing a research proposal, and carrying out an individual or group project. This course must be included among the first six courses taken by each student. *Prereq.: ED 3340 Introduction to Educational Statistics or successful completion of the statistics proficiency examination.* (Students wishing to make arrangements to take the proficiency examination should call 437-3305.)

ED 3343 Advanced Research Design

This course focuses on methodologies for collecting, interpreting, and evaluating data and deals with biases encountered in the data-collection process. Topics such as data collection and interpretation, use of sampling, analysis of variance, covariance, multiple regression, multivariate procedures, and advanced topics in scaling, semantic differential methodology, questionnaire design, interview methodology, and evaluative criteria will be featured. Students enrolling for this course will design and complete a proposal on this design for the conduct of a research project. This project may be carried out as part of research on either the master's or doctoral level. *Prereq.: ED 3341 Intermediate Educational Statistics or equivalent, or permission of instructor.*

ED 3344 Nonquantitative Research Methods in Education

Nonquantitative research methods in the human development professions. Among the topics considered are problem formulation, location and selection of data, authenticity of sources, and analysis of data by synthesis. Case-study approaches and style of writing for research proposals are also discussed. *Prereq.: ED 3341 Intermediate Educational Statistics.*

ED 3345 Nature and Theory of Psychological and Educational Measurement

An examination of the logic of measurement and the nature of human capacities, aptitudes, and abilities. Characteristics of tests, ratings, questionnaires, and similar instruments are reviewed with emphasis on

their reliability, validity, and utility. Item analysis procedures and test standardization are covered.

ED 3346, 3347 Independent Research Seminars I and II

4 Q.H. each

Focus is on the design, conduct, analysis, and reporting of data from an individual research project. This project may be original or secondary, applied, theoretical, or action research and must be substantially larger in scope than that accommodated by Directed Study. Evaluation will be based on oral and written interim reports in Seminar I and oral and written final reports in Seminar II. This course will serve as an option to the thesis requirement only for students enrolled in the master's degree program in Educational Research.

ED 3348 Research and Statistical Methods for Administrators

A study of the application of the methods of research and statistical techniques to problem solving, with specific focus on the role of research in the administrative decision-making process. The course of study may also focus on the various research designs administrators may use in their positions, such as the development of a program proposal for local, state, or federal agencies. A specific topic of practical significance in administration is to be selected by the student and a design for studying the topical problem developed. Research relevant to the topic is evaluated. *Recommended prereq.: Rudimentary knowledge of research designs and techniques and an elementary knowledge of basic statistical methods.*

ED 3400 Analysis of the Instructional Process

A consideration of the rational basis for effective teaching and the nature of the educational process. Learning theory is related to the various strategies and activities that can be implemented with a learning situation to meet the needs of the learners, including those with special needs. Alternative approaches, research results, and theoretical constructs are employed to help extend the prospective teacher's concepts of the educational process and the role of the teacher in it. *(15 hours of field work required.)*

ED 3401 Fundamentals of Curriculum Development

An examination of how goals and objectives are selected and how priorities are determined. Methods of designing educational programs to meet specified goals and methods of evaluating educational outcomes in terms of the goals of the program and techniques for modifying programs in the light of such performance.

ED 3402 Methods and Materials for Teaching Children I

Teaching methods and learning materials used in teaching children in a number of educational settings. This course will help students establish objectives, plan and execute appropriate learning experiences, and evaluate outcomes. *(15 hours of field work required.)*

ED 3403 Methods and Materials for Teaching Children II

A continuation of ED 3402. *Prereq.: ED 3402 Methods and Materials for Teaching Children I. (15 hours of field work required.)*

ED 3404 Methods and Materials for Teaching Adolescents and Adults I

Consideration of specific methods and materials appropriate to teaching adolescents and adults to develop in the students an understanding of the complexities of the materials and methodology of the teaching-learning process, to encourage within students attitudes conducive to and identified with good tenets of teaching, and to foster in the students acceptance of the need to grow constantly and to be aware of the continuing development of our knowledge of the learning-teaching process. *(15 hours of field work required.)*

ED 3405 Methods and Materials for Teaching Adolescents and Adults II

This course provides for the specific subject areas to be attended to. Topics covered include techniques of organizing and presenting lessons, developing teaching materials, using audiovisual equipment, developing and implementing evaluation instruments, and selecting appropriate materials within each field of interest. *(15 hours of field work required.)*

ED 3406 Procedures of Evaluation

Consideration is given to evaluation as a process for the improvement of learning and instruction. The course concerning itself with such topics as how to measure and evaluate effective, psychomotor, and cognitive dimensions of student growth; test construction; collecting and administering standardized tests; various bases of grading; and methods of reporting student progress.

ED 3407 Student Teaching with Related Seminar 8 Q.H.

A University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of the University. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. *Prereq.: Course in child or adolescent psychology; successful completion of all course work in the nondegree program. (Open only to students in the nondegree Curriculum and Instruction program.)*

ED 3408 The Evolution of Curriculum Theory and Practice

Examination from a historical perspective of the curriculum of the American school as an evolutionary process resulting in part from conflict between subject-oriented and student-oriented curricula, traditionalists and revisionists, behaviorism and psychodynamism, and the interplay of forces gener-

ated by students, teachers, administrators, and other interested groups. Present curricula will be analyzed as the outcomes of such influences and trends for future developments will be hypothesized. Hence, the course will also focus on the process of curriculum development and the product of that development.

ED 3409 Seminar in Curriculum: Alternative Designs

Identification and analysis of problems in curriculum and instruction in light of the forces affecting the curriculum within the student's area of specialization; design and implementation of solutions to such problems; evaluation and field testing, where feasible. *Prereq.: ED 3408 The Evolution of Curriculum Theory and Practice*

ED 3410 International Perspectives on Curriculum Planning and Development

This course will involve students in assessing cross-cultural curricular planning and development, assumptions underlying particular principles, and the process and problems that are related to curriculum organization in developing, industrialized, and agrarian societies. Students will establish criteria for experientially based curricula in both formal and informal educational settings. They will apply the criteria developed to assess curricular patterns already in existence and to new models that they develop to meet academic and societal needs within their own cultures.

ED 3411 Seminar in Instruction: Alternative Designs

Methods of inventing or adapting methods of teaching to make them appropriate to the demands of the curriculum, the needs of the students, the capabilities of the teachers, the expectations of the community, and the resources of the school or college. This course will help the student identify the criteria by which instructional practices may be selected, by which they may be evaluated, and by which they may be developed. Instructional practices include methods of teaching, designing learning materials, grouping students, pacing, scheduling, and evaluating. Students will have the opportunity to revise existing resources and to create new resources for instruction in order to make the implementation of a specific curriculum more effective. *Prereq.: (except for students in joint programs with a department in another college): ED 3409 Seminar in Curriculum: Alternative Designs (may be taken concurrently); Prep. for students in joint programs with a department in another college is ED 3400 Analysis of the Instructional Process or equivalent.*

ED 3412, 3413 Seminar in the State of the Art and Field Project 8 Q.H.

Students will examine the current curricular and instructional issues in specific teaching areas or levels, hypothesizing and projecting possible future directions in curriculum and instruction in these areas; integration of the results of these inquiries into coherent understandings of the state of the art in these areas and the development of a special project to be

implemented by the students within the context of their own teaching experiences. Seminars will be held over a period of two quarters every other week. *Prereq.: Teaching experience.*

ED 3414 Seminar in Supervision of Instruction/Reading

This seminar examines the role of the supervisor and consultant in organizing and implementing programs. Aspects include organizational plans, staff supervision and development, working with parents, and accommodating special needs children.

ED 3415 Seminar in Supervision of Instruction Practicum **8 Q.H.**

Students apply the skills learned in the seminar to a field setting. Student field work is supervised by an on-site person and a professor. At periodic seminars, projects are selected and discussed. Students plan the projects and implement these in the field. Students also plan and carry out a project evaluation.

ED 3420 The English-Language Arts Curriculum

The design and function of the English-language arts curriculum; selected current issues as they impinge upon the English language arts curriculum; the design and function of research in the English language arts curriculum. Open to certified or experienced teachers. *Prereq.: Permission of instructor.*

ED 3421 Literature in the English-Language Arts Curriculum

The historical-social, psychological, personal, archetypal, textual, biographical, and philosophical-moral aspects of literary study and their relation to the chronological, thematic, and generic demands of the literature program; the sources of interest in literature as they related to the young reader and their implications for the English-language arts curriculum; the interrelatedness of literature and other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prereq.: ED 3420 The English-Language Arts Curriculum or permission of instructor.*

ED 3422 Writing in the English-Language Arts Curriculum

The cognitive and effective bases of imaginative and nonimaginative writing; the role of writing in the relationship between self and object; modes of imaginative and nonimaginative writing appropriate to the young writer; the impulse to expression in the young writer and its implications for the English-language arts curriculum; the interrelatedness of writing and other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prereq.: ED 3420 The English-Language Arts Curriculum or permission of instructor.*

ED 3423 Language in the English-Language Arts Curriculum

An examination of the multiple dimensions of language study in the English-language arts curriculum;

the role of inquiry in the study of language and its implications for the English-language arts curriculum; theories of grammar and their relation to the study of language in the English-language arts curriculum; the interrelatedness of language and the other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prereq.: ED 3420 The English-Language Arts Curriculum or permission of instructor.*

ED 3424 Topics in English-Language Arts Education

An investigation of a matter of immediate concern to English-language arts education, but for which no organized study is ordinarily available. Typical topics include media in the English-language arts program, behavioral objectives in the English-language arts program, the English-language arts program for the disadvantaged. Each year the seminar topic for that year is announced prior to registration.

ED 3425 English as a Second Language I

First course in teaching ESL, introducing the basic linguistic, cultural, and psychological concepts. Analysis of current approaches to teaching ESL locally and internationally from the standpoint of diagnosis, grouping, use of particular methods, and materials. Observations of local ongoing ESL programs will be included. *Prereq.: ED 3453 Diagnosis and Remediation of Reading and Language Disabilities I or permission of instructor.*

ED 3426 English as a Second Language II

Second course in the ESL sequence which emphasizes innovative means in teaching ESL. Specific projects according to student need and interest will be developed; supervised clinical work. *Prereq.: ED 3425 English as a Second Language I.*

ED 3427 Literature and Materials Seminar

Literature for children, adolescents, and adults; the sources of interest in literature as they relate to the reader; the interrelatedness of literature and other components of the language arts program; investigation of materials available. Students will develop projects related to their needs and interests.

ED 3430 History and the Social Studies in the School Curriculum

Permits the student to explore some of the fundamental concepts of anthropology, sociology, economics, political science, and history. Emphasis will be given to the interrelatedness of disciplines and to the extraction of operating principles from those that aid in the analyses of social problems. As a consequence of such analyses, the student should be equipped to find a greater variety of conceptual relationships within the historical social science field. From there a framework for evolving courses of study may be generated. *Prereq.: Teaching experience or certification.*

ED 3431 Social Science Materials Seminar

A curriculum course wherein the knowledge previously acquired will be used to establish criteria for the selection and development of curriculum materials. All materials of instruction will be viewed as means of implementation of objectives relating to specific social science concepts and skills. An effort will be made to personalize and concretize abstract phenomena and to demonstrate their impact on the quality of human lives. Students will examine and analyze prepared curricula and will be asked to develop original materials that include provision for the integration of a variety of thinking, reading, and social skills. *Prereq.: Teaching experience or certification.*

ED 3432 Seminar in Current Issues in the Social Studies

A content approach to problems of political, economic, and social significance which have contemporary relevance for teachers of the social sciences.

ED 3440 Remediation in Mathematics

An effective approach to the teaching of mathematics; diagnosis and remediation of difficulties, alternative teaching methods, techniques for the improvement of student skills and of student attitudes toward mathematics.

ED 3442 Seminar in Mathematics Education

Students are expected to analyze a mathematics learning problem, to investigate relevant research, and to prepare materials embodying their own proposed solutions. *Prereq.: Permission of instructor.*

ED 3444 Implementing Change in Science and Mathematics Education

The planning, organization, and execution of in-service experiences for teachers, related to all phases of science and mathematics education from subject matter courses to curriculum planning to materials workshops. *Prereq.: Teaching experience or certification.*

ED 3450 Foundations of Developmental Reading

Reading and writing as the receiving and generating of language; current developmental reading, writing, and related language skills; selected research findings bearing on relevant topics. (This course includes ten hours of observation or other field experience.)

ED 3451 Language and Reading

Introductory course in linguistics with emphasis on implications for reading and language instruction. Topics include the nature of language, introduction to the development of syntax, phonology and semantics, English orthography, the grammar of child language, and dialectology. *Prereq.: ED 3450 Foundations of Developmental Reading or consent of instructor.*

ED 3452 Current Issues in Reading and Language

Three or four topics of current interest in reading and language education are investigated in depth over a three- or four-week period each during the

quarter. Typical topics might include lectures and reading on sexism in reading materials, Chapter 766 and its implications for reading and language education, "back to basics," reading and language in the open and alternative education program, problems of illiteracy, bilingual and bicultural education and reading/language instruction.

ED 3453 Diagnosis and Remediation of Reading and Language Disabilities I

Reading and language disabilities; causes and correlates of disability; language differences; aspects of measurement; diagnostic and corrective procedures in reading, writing, and related language skills; selected research findings bearing on relevant topics. *Prereq.: ED 3450 Foundations of Developmental Reading.*

ED 3454 Diagnosis and Remediation of Reading and Language Disabilities II

Second course in Reading and Language Disabilities, including an examination of selected models of language processes; cognitive and effective dimensions; problems in language pathology; and other learning disabilities, including academic, perceptual-motor, and neurological areas. *Prereq.: ED 3453 Diagnosis and Remediation of Reading and Language Disabilities I.*

ED 3455 Teaching Reading in Junior and Senior High School

Developmental or corrective reading programs at the secondary level. Development of reading rate, comprehension, interpretation, and study skills in the content areas.

ED 3456 Teaching Reading to the Deaf

Modern methods in use, such as the Fitzgerald Key and the Natural Language Approach. Emphasis is on using language in natural situations through lip reading and writing, with later emphasis on the formal presentation of language principles. Methods used to develop reading experiences that focus on content rather than mechanics are also covered as well as considerations appropriate to the development of a balanced reading program that provides adequate motivation, a wide variety of rich materials, a well-organized sequence of reading experiences, and provisions for evaluation.

ED 3457 Clinical Practicum in Reading

Practicum in clinical experience, tutoring children and adults with severe reading disabilities in the Reading Clinic for a total of seventy hours under close staff supervision. A one-hour seminar follows each tutoring session for purposes of discussion and case presentation. Diagnosis, lesson plans, daily logs, complete case history, and final progress evaluation are required of each student. *Prereq.: ED 3453-3454 Diagnosis and Remediation of Reading and Language Disabilities I & II.*

ED 3458 Field Practicum in Reading

Eighty-hour field practicum offers students the opportunity to apply consulting and remediation skills in a school setting. Students may consult with teachers on the implementation of developmental and corrective reading and on reading in the content areas and also may provide diagnostic and remediation to pupils having special needs in reading. *Prereq.: ED 3453-3454 Diagnosis and Remediation of Reading and Language Disabilities I & II and ED 3457 Clinical Practicum in Reading.*

ED 3460 International Perspectives on Teaching and Learning

This course will deal with categories of learning experience and modes of acquisition of learning. Developmental needs of learners and their relationship, prevailing pedagogical patterns and societal problems in cross-cultural settings will be emphasized. African, Asian, European, and Latin-American cultures may be used as contexts for analysis of these issues.

ED 3461 Bilingual Education, Methods, and Materials

An introductory course in the problems, programs, and principles of bilingual/bicultural education. Emphasis will be on the current methods and materials used in programs nationally and internationally. Curricular aspects of bilingual/bicultural programs will be studied, as well as available research. *Prereq.: Permission of instructor.*

ED 3462 Seminar: Ethnicity and Today's School Curriculum

Students will briefly review aspects of the history and culture of some ethnic groups to explore the unique manner in which certain universal needs are manifested. Prepared curricular materials, as well as authentic literary, visual, and artifact materials, will be analyzed, evaluated, and related to developed criteria, goals, and potential curricular impact in projecting the aforementioned cross-cultural needs or themes. Students will be asked to select, organize, and, as necessary, develop independent materials and strategies appropriate for classroom use. Efforts will be made to categorize developed units of work on various ethnic groups which appear to have significant parallel dimensions according to predetermined categories.

ED 3463 Urban Education: An Introduction to Teaching in City Schools

An introductory course offering students an overview of urban education, especially in the public schools. The demography of city schools is studied as a basis for identifying diverse special education needs of the multicultural population, such as ESL, bilingual education, and ESD. Study includes an overview and investigation of current curricular patterns related to this area of education. Readings, guest speakers, and first-hand observations of selected schools and programs are included in the course content.

ED 3470 Teaching Adults: Methods and Materials

Designed to help prepare participants to instruct adults in a variety of academic and nonacademic settings, the course emphasizes the skills and knowledge necessary to identify objectives, plan and execute appropriate lesson plans in keeping with students' requirements, develop curricula in a variety of settings, and evaluate students' performance. Class activities include the presentation of both theory and application through selected case studies that exemplify adult teaching in different environments. Participants also have the opportunity to acquire the necessary skills for developing individual models of adult teaching behavior to suit various circumstances.

ED 3471 Methods and Materials in Adult Literacy

This course will introduce students to some current diagnostic and instructional approaches to the functionally and totally illiterate adult. Current methods and materials will be analyzed and evaluated. Special projects may include the development of informal diagnostic instruments and/or instructional materials for particular adult learners. An overview of national and world literacy problems and programs will also be offered.

ED 3482 Principles of Programmed Instruction

The development and current status of self-instructional devices. A survey of available programs and teaching machines, including audiovisual machines, with emphasis on the details of the construction and evaluation of programs.

ED 3484 Selection and Utilization of Instructional Material

This course deals with all aspects of instructional media, surveying types, techniques, advantages, limitations, sources, and methods of using materials and equipment in specified areas. Emphasis is on the selection of appropriate media (print and nonprint) to suit given learning objectives. Laboratory experience in operation of equipment and the production of instructional materials is provided.

ED 3486 Developing Multimedia Learning Packages

During this course each student will produce a multimedia (print and nonprint) instructional package for individualized learning.

ED 3500 Leadership in Education, Part I

Part I of a two-term core course designed to introduce the student to concepts of formal organization. This core, consisting of a two-part sequence, is prerequisite to further study in the Department of Educational Administration. Part I may provide the student with an overview of formal organizations as social systems, with emphasis given to the leadership function. Relationships between individuals and organizations are considered. Communications and decision-making functions are analyzed and examined.

ED 3501 Leadership in Education, Part II

Part II continues an emphasis on the leadership function in organizations. It examines selected informal

organization elements such as motivation, normative order, social power, conflict, conformity, and creativity. Attention is given to processes of change and innovation in organizations. *Prereq.: ED 3500 must be completed before enrollment in ED 3501.*

ED 3502 Instructional Leadership: Curriculum Development and Supervision

This course views the responsibilities of administrative personnel relating to the improvement of curricular and instructional practices. Evaluative techniques, inservice education, supervisory procedures, and innovative programs are among the areas of consideration. Students may have the opportunity to become engaged in supervisory projects individually or in small teams. *Prereq.: ED 3500 and ED 3501, or permission of instructor.*

Certain of the following courses in Educational Administration may be open only to CAGS and doctoral degree candidates or by special permission of the department chairperson, granted prior to registration.

ED 3503 Current Issues in Educational Administration

A seminar required of all students pursuing the CAGS. Critical and contemporary issues which face administrators will be examined. The status of the administrator; federal, state, and local revenue sources; accountability; teacher militancy; equal educational opportunity; controls of schools; and urban education problems are examples of topics that will be analyzed.

ED 3504 Human Relations Skills for Administrators

This course offers students the opportunity to examine methods of diagnosing problems and responding in management contexts; analyzing the norms, influence patterns, roles, and control systems of organizations; performing some of the critical skills required in the leadership of human organizations; and managing an intervention for the purpose of solving an organizational problem. *Prereq.: CRS 3405 Group Dynamics or equivalent.*

ED 3505 The Process of Administration

A course required of all students pursuing the CAGS. Case analysis and group activity will be utilized to gain insight into such areas as the improvement of organizational morale, professional job satisfaction, and current issues of involvement and conflict. Students will also examine alternative courses of action to cope with problematical events confronting educational administrators.

ED 3506 Administration of Early Childhood Education

This course will include the study of significant elements of administration unique to the planning, implementation, and operation of an early childhood education center. Areas of concern are funding sources, intra-institutional relationships, patterns for designing early childhood programs, onsite visitations, modes of private governance, use of plant,

student and teacher placement, role of volunteers, and related topics. *Prereq.: ED 3500 and ED 3501.*

ED 3507 Administration of the Elementary School

A survey of the operational tasks performed by the elementary school administrator. Included will be school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prereq.: ED 3500, ED 3501, or permission of instructor.*

ED 3508 Administration of the Secondary School

A survey of the operational tasks performed by the secondary school administrator. Included will be school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prereq.: ED 3500, ED 3501, or permission of instructor.*

ED 3509 Administration of Two-Year Colleges

Emergence of the community college movement in the United States, administrative structures and governance, the role of faculty in planning, the student population and related student personnel services will be examined. Particular emphasis is placed upon the identification and utilization of community resources in curriculum development and the college's total relationships with the community in which it exists. The two-year technical institute and both publicly and privately supported junior colleges will be studied. Field visits are an integral part of course requirements.

ED 3510 Academic Administration in Higher Education

Recruitment of properly qualified faculty and staff is only one problem of the academic administrator. This course will also consider the problems of pupil services, admissions, athletics, curriculum development, accreditation, instructional resources, registration and scheduling, faculty organization, continuing education, faculty rights and responsibilities, and personnel policies.

ED 3511 Administration of Cooperative Education

An examination of significant elements in the planning, implementation, and operation of a cooperative education program. Areas of concern include agents for institutional change, intra-institutional relationships, program costs and funding sources, cooperative education calendars, development of cooperative work assignments, relationships with cooperative employers, and operational policies.

ED 3512 Administration of Adult and Continuing Education

The historical development of adult and part-time education, with attention to the present status and trends for the future, will be studied, with emphasis on the administration of these programs. A variety of adult educational programs in schools, colleges, junior colleges, religious agencies, social service

organizations, business and industry, and professional organizations will be included, focusing on planning, implementing, administering, financing, and evaluating such programs.

ED 3513 Problems in Urban School Administration

This course examines the problems of educational administration in the complex city school system with emphasis on solutions to educational problems caused by the unique demographic characteristics of the city.

ED 3514 Administration of Experiential Education Programs

This course will focus on the planning, organizing, budgeting, implementing, and evaluating of experiential education programs, with particular emphasis on work-related programs in a variety of countries. An examination of the development and operation of such programs as cooperative education, cooperative work experience, external degree, "sandwich courses," "*enseignement en alternance*," study service, and other work/school arrangements will lead to discussion of the administrative problems involved. Additional topics may include off-campus learning, administrative involvement in assessment, appropriate supervision techniques, and the development of a rationale for work in the curriculum.

ED 3515 The Administrator's Role in Supervision and Evaluation

The course examines the leadership role as it relates to supervision and evaluation. Through role playing, case analysis, and the use of videotapes, students have the opportunity to engage in activities typically required of building or unit administrators. A variety of supervisory and evaluation techniques and formats appropriate to both formative and summative evaluations are presented for examination.

ED 3516 Administration and Supervision of Special Education

Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs. Facilities and curriculum adjustments, staff roles, methods and content for in-service training, and the use of the team approach are studied. Field trips to observe and evaluate programs may be required.

ED 3517 Simulated Problems: Elementary School Administration

The course is designed to place each student in a simulated decision-making situation as a principal or administrator of an elementary school. Background materials have been prepared which describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socioeconomic makeup. These background data may be disseminated through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prereq.: ED 3500, ED 3501, or permission of instructor.*

ED 3518 Simulated Problems: Secondary School Administration

The course is designed to place each student in a simulated decision-making situation as a principal or administrator of a secondary school. Background materials have been prepared which describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socioeconomic makeup. These background data may be disseminated through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prereq.: ED 3500, ED 3501, or permission of instructor.*

ED 3521 Problems in College Administration: A Simulated Experience

This seminar is designed to place each student in simulated decision-making situations as an administrator of a college or junior college. Background materials have been prepared which describe many aspects of a college, including its policies, the makeup of its faculty and student body, its financial situation, the community it serves, and its board of control. *Prereq.: ED 3528 Financial Management in Higher Education or permission of instructor.*

ED 3522 Simulated Problems: Administration of Occupational and Career Education

Each student is confronted with a series of simulated decision-making situations such as those which are usually faced by administrators of programs in the area of occupational and career education. Readings, audiovisual material, and class interactions constitute the design of this course.

ED 3523 Seminar in Educational Administration

A culminating experience for students majoring in school administration at the master's level. The student is confronted with major issues facing the school and its administrators. Emphasis is placed upon applying knowledge gained in previous administrative courses to an understanding of contemporary education problems. *Prereq.: ED 3500, ED 3501, or permission of instructor.*

ED 3524 Seminar in Occupational and Career Education

Students will be confronted with a sampling of the major issues facing administrators and supervisors of occupational and career education programs in their efforts to organize, promote, and operate such programs. Emphasis will be placed on applying the knowledge acquired in previous courses and other program experiences to arrive at an understanding of contemporary occupational and career education problems and their solutions.

ED 3525 Personnel Administration

The purposes, patterns, and issues in personnel administration are the major considerations of the course. Study will include the skills, attitudes, and knowledge which an institutional staff needs to have

and which are essential to the accomplishments of organizational goals. Personnel administration programs and problems will serve as the focus for the course.

ED 3526 Educational Finance

The study of school finance deals with the principles and problems of financing education, and also considers the basic concepts of economics relative to the place of school finance in the field of public finance. The sources and rationale for public support of schools are examined. Selected state and federal aid programs, capital outlay programs, current practices and issues of local support, and bond issue campaigns are included in this study.

ED 3527 School Business Management

Practices and issues in the administration of school business affairs are the major concerns of the course. The role of the school business administrator and the educational budget will be examined. Attention will be paid to principles of budget preparation and development, purchasing, supply management and distribution, school accounting and data-processing systems, auditing, financial reporting and management of payroll, transportation programs, and school food services, and the operation and maintenance programs for the physical plants. In addition, each student will be placed in a simulated decision-making situation. Background materials have been prepared describing aspects of a fictitious school system, including its publics, policies, and other relevant information. Each student may have the opportunity to deal with matters typically faced by the school business administrator.

ED 3528 Financial Management in Higher Education

This course seeks to combine a knowledge of fund-raising activities with the study of proper financial management in higher educational institutions. The problems of fund raising for both public and private, two- and four-year institutions will be considered. Modern techniques of budget preparation and control may include purchasing, school accounting, data processing, providing benefits for faculty, financial reporting, food services, housing, and operation and maintenance of the physical plant.

ED 3529 School Plant Planning, Operation, and Maintenance

This course seeks to have the student develop a basic understanding of the processes involved in the planning, maintenance, and operation of school plants. Such items as educational specifications, the process of school construction, techniques for providing clean, safe, and healthy environments for the teaching-learning process, along with the selection, assignment, and supervision of custodial and maintenance staff will be involved. Statutes or regulations pertaining to these processes used by state and local regulatory bodies will also be reviewed. Consideration will be given to issues related to declining enrollments and school closings.

ED 3530 Institutional Planning and Facilities

This course will consider the planning of new colleges as well as the expansion and maintenance of existing ones. Systems analysis, needs surveys, and development of educational specifications for college facilities will constitute half of the course. The other half will involve studying the operation and maintenance of the physical plant, including provisions for housing, safety, parking, communications, and health service.

ED 3531 Systems Theory in Education

This course is required of all students pursuing the CAGS. The course provides the student with an introduction to general systems concepts and terminology as well as the implications of systems theory to leadership and administration. Topics include systems applications such as input/output analysis, PERT, feedback monitoring and response, flowchart logic, and the computer as a system. Consideration is given to systems study as a method of planning and evaluation.

ED 3532 Organizational Analysis

Open only to advanced graduate students, this course will include examination of different approaches used to define traits or characteristics of formal organization. Special emphasis will be placed on the application of models, typologies, and schemes to identify structural or procedural deficiencies in bureaucratic social systems. *Prereq.: Permission of instructor.*

ED 3534 School-Community Relations

This course includes the study and design of school-community relations programs based on the principles and practices of the intercommunications between the school and its several publics. Selected research findings relative to public relations programs in business, industry, and governmental agencies will be reviewed in addition to those involving educational systems. Stress will be placed on the role of the administrator in the development of a comprehensive program of school community relations to the administrative unit.

ED 3535 School Law

The student will be expected to develop a basic understanding of federal and state laws that apply to school systems, educational programs, and personnel, as well as of the legal prerogatives available to the practicing administrator and the local boards of education. This study will include consideration of the constitutional, statutory, and common-law foundations of educational systems and the school administrator's role with respect to them.

ED 3536 Collective Negotiations in Education

This course is designed to provide prospective administrators and those already engaged in administration with knowledge of the collective negotiation process and collective negotiation strategies and tactics. Designed as a systems approach to collective negotiations, simulation exercises and cases will be used to provide practical exercises for students.

When arrangements can be made, guest lecturers experienced in collective negotiations will be invited to the seminar.

ED 3537 Program Planning and Workshop Design

Administrators who wish to be effective must know the techniques for directing client-needs assessment. This course presents a variety of strategies designed to help students develop skill at assessing client needs, followed by discussions regarding ways in which these needs are translated into program/workshop objectives. The administrator's role in program and workshop design, with emphasis on managing the learning activities, is demonstrated through student involvement in administrative activities. Attention is devoted to the variety of settings in which adult-education administrators work, including educational institutions, business and industry, governmental agencies, and human-service organizations.

ED 3538 Securing and Administering Grants in Education

This course is designed to provide school administrators with knowledge of fund raising for educational purposes and supervisory techniques for funded programs. Designed as a systems approach to grantsmanship, the course will emphasize the methods and techniques of fund raising, program planning, and proposal writing.

ED 3540 Typologies of Higher Education

A study of the types of higher educational institutions, with emphasis on organizational structure, modes of governance, and administration. The history of higher education, particularly the development of colleges, universities, and junior colleges in the United States, will be considered to provide perspective for the modern college administrator. Important issues and the problems they present for administrators will provide the major focus of this course.

ED 3541 Innovation and Change

A course required of all students pursuing the CAGS. Major emphasis is upon administrative strategies in effecting structural alterations, curricular organization, and instructional techniques. The nature of these alterations varies with the particular problems relevant to the issues that receive consideration.

ED 3542 Politics and Educational Decision Making

This course examines federal, state, and local governmental arrangements and political processes which influence educational policies of school systems. Emphasis is given to the application of political science concepts and research methods to educational policy-making processes and to the political environment surrounding the educational administrator.

ED 3543 Directed Field Experiences in the Administration of the Elementary School

Required of all master's candidates who major in school administration. Study and discussion of administrative functions may be coordinated with selected field trips to administrative settings and with

guest lectures by practicing elementary school administrators. These experiences usually involve visits to such settings as an elementary school, a middle school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. In addition, each student will be expected to participate in an administrative field experience in an elementary setting for a minimum of four hours per week. *Prereq.: ED 3500 or permission of instructor.*

ED 3544 Directed Field Experiences in the Administration of the Secondary School

A companion course to ED 3543, required of all master's candidates in school administration. Study and discussion of administrative functions may be coordinated with selected field trips to administrative settings and with guest lectures by practicing secondary school administrators. These experiences are aimed at educational agencies at the secondary level and may include visits to a comprehensive high school, a junior high school, a regional vocational-technical school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. In addition, each student will be required to participate in an administrative field experience in a secondary school for a minimum of four hours each week. *Prereq.: ED 3500 or permission of instructor.* (ED 3544 may be a continuation of ED 3543 or may precede it.)

ED 3545 Practicum Administration

This is an individualized offering involving supervised observations, internships, externships, and seminars in educational administration. It is designed to provide further practical experience in the student's area of administrative preparation. The administrative internship program must be worked out with the adviser not later than the end of the second week of the quarter preceding the quarter during which the internship will take place.

ED 3546 Practicum in Special Education Administration

An individualized offering for students preparing for administrative roles in areas of special education. The course offers experiences in supervised observations, internships, externships, and seminars in special education administration. The administrative internship program must be worked out with the student's adviser not later than the end of the second week of the quarter preceding that in which the internship is to take place.

ED 3800 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Not available to special students.* *Prereq.: Approval of the chairperson of the department and of the director of the graduate school. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

ED 3801 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

ED 3806, 3807, 3808 Doctoral Seminar in Leadership; Administration and Supervision I, II, III

A series of three seminars required of all students pursuing the Ed.D. degree. The dialogues in these courses will use an interdisciplinary approach to explore complex behavioral and structural interactions found in formal organizations. Major emphasis will be placed upon integrating theoretical concerns with practical administrative functioning.

This sequence of seminars is viewed primarily as a pooling of the results of extensive individual student research and activities and is aimed at giving the student an overview of all aspects of the institution he or she will be leading. (These seminars open only to students who have been accepted to a doctoral program.)

ED 3809 Doctoral Dissertation

Prereq.: Admission to candidacy in the Doctor of Education degree program.

ED 3820 Workshop in Foundations of Education
(See general workshop description on page 86.)**ED 3821 Workshop in Elementary Education**
(See general workshop description on page 86.)**ED 3822 Workshop in Secondary Education**
(See general workshop description on page 86.)**ED 3823 Workshop in Administration**
(See general workshop description on page 86.)**ED 3825 Institute in Elementary Education**
(See general institute description on page 86.)**ED 3826 Institute in Secondary Education**
(See general institute description on page 86.)**ED 3827 Institute in Educational Administration**
(See general institute description on page 86.)**ED 3828 Institute in Foundations of Education**
(See general institute description on page 86.)

Health, Sport, and Leisure Studies

HSL 3410 Contemporary Theories of Recreation and Sport

Historical and philosophical perspectives of recreation, sport, and leisure. Special emphasis on change over time and its implications for the leisure industry.

HSL 3411 Program Evaluation in Recreation and Leisure Services

Focuses on comprehensive systems for evaluating program effectiveness as they relate to the consumer of recreation and leisure services. Major emphasis is placed on developing an evaluation system for an agency of the student's choice. Case studies are drawn from the public, nonprofit, and commercial sectors. *Required of all students in Recreation and Leisure Studies.*

HSL 3412 Seminar in Contemporary Issues and Problems in Recreation and Leisure Services

Discussion of national and international issues, current trends, and contemporary problems as they affect recreation services. *Required of all students in Recreation and Leisure Studies. Prereq.: HSL 3410.*

HSL 3420 Grantsmanship

A seminar in which the student has the opportunity to develop a grant proposal for submission to a funding source chosen by the student. Government and foundation grant programs are explored.

HSL 3421 Budget Analysis

Capital and operating budgets are analyzed using such techniques as cost-effectiveness and benefit-cost analysis, forecasting, and present value analysis. The concepts of depreciation, direct and indirect

costs, and service volume are studied as they relate to pricing decisions. Focus is on improving management decisions.

HSL 3422 Administration of Resident Camp Programs

An in-depth study of staffing, sanitation, and health; purchasing and storage of food, materials, equipment, and supplies; kitchen management; insurance, construction, and maintenance of buildings; and program areas as they affect resident camping programs. A study of nationwide goals and trends in the camping movement is included.

HSL 3423 Advanced Organization and Administration of Recreation and Leisure Services

Patterns for the implementation of recreation and leisure services by school systems, voluntary agencies, national service organizations, municipal governments, and state and federal agencies investigated in depth.

HSL 3424 Programs in Recreation and Leisure Services

An examination and evaluation of program content, leadership, administration, and facilities in recreation and leisure services sponsored under public, private, religious, industrial, and voluntary auspices.

HSL 3425 Public Relations for Recreation and Leisure Service Agencies

The central purpose of public relations is to influence public opinion. This course focuses on practical and ethical aspects of public relations for recreation and

leisure service agencies. Case studies are drawn from the public, nonprofit, and commercial sectors.

HSL 3426 Politics and Bureaucracy in Recreation and Leisure Services

Practical problems faced by recreation professionals in public service are investigated. Students study relationships between elected officials, bureaucrats, peers, subordinates, and supervisors in state and local governments.

HSL 3427 Recreation and the Community School: Concepts and Practices

The role of recreation studies as an integral part of programming for the community school. An analysis of the community school concept with regard to philosophy, physical plant requirements, personnel, finance, and community involvement.

HSL 3428 Leisure and Delinquent Behavior

Recreation studied as an intervention strategy to prevent and rehabilitate delinquent behavior.

HSL 3441 Seminar on Programming in Therapeutic Recreation

An overview of systems analysis and design techniques and their application. Emphasis is on therapeutic recreation planning at the administrative level. *Prereq.: An undergraduate program planning course in therapeutic recreation.*

HSL 3442 Therapeutic Recreation Services for Individuals with Disabilities

An introduction to the nature and scope of therapeutic recreation, including a review of its history and recent advances in professionalization. The role of service delivery in various settings and the major issues confronting this professional specialization are examined.

HSL 3443 Observations of Therapeutic Recreation in Treatment Settings

Guided observation sessions under professional supervision in various clinical settings. Group seminars are held to familiarize students as to the role of the rehabilitation team. *Prereq.: HSL 3442 or permission of the instructor.*

HSL 3450 European Mountaineering

An intense six-day course that covers the basic skills of technical climbing. The course is conducted by the International School of Mountaineering. English-speaking guides extend all students to the utmost of their abilities in various climbing situations: free climbing; ice climbing near Chamonix, France; artificial climbing; or mountain rescue. Climbing is done in a voluntary, relaxed manner with the purpose of learning to enjoy the mountains creatively and safely.

HSL 3451 European Backpacking and Orienteering

A practical course in the basics of safe mountain living and travel on foot. Subjects covered include group leadership, fauna and flora of the Alpine environment, mountain geology, mountain first aid, and orienteering. Students have the opportunity to par-

ticipate in several day hikes in the vicinity of Leysin, where scenic walking paths abound, and two extended back-packing trips in contrasting areas of Switzerland. The European style of back-packing differs greatly from the traditional American practice of tenting, employing Alpine huts and refuges.

HSL 3452 Comparative European Recreation

A presentation of recreation, European-style. Guest lecturers, movies, group discussion, and field trips help to present the Western European approach to recreation and sport. The critical contemporary issues of facility construction, program structure and development, government support, and treatment of special populations are viewed through the European perspective and compared to the American scene. Among the topics included are recreation and tourism in a mountain society, the European club system, Swiss park construction, therapeutic recreation in Switzerland, mountain rescue, and tourism as a part of recreation. The outstanding recreation facilities of Geneva are visited during the course. A written test and paper are required.

HSL 3500 Health Issues: Implications for Education

An analysis of selected major health issues in health education. Emphasis is on the importance of current research findings to health education programs in a variety of settings.

HSL 3501 School Health Education Curriculum

A study of selected curricula for school health programs, emphasizing the organization of curriculum components into an effective approach to health promotion and disease prevention in the school setting. An attempt is made to relate course activities to the needs of Massachusetts schools.

HSL 3502 Educational Strategies in Health Education

An analysis of contemporary educational techniques, concepts, and approaches of importance to the health educator in a school, community health agency, or medical setting. The use of educational diagnosis in determining appropriate educational strategies is emphasized as the major means of preventing health problems and improving health status. Health behavior models are presented as a basis for educational diagnosis.

HSL 3503 Contemporary World Health

A survey of the state of the world's health, the progress which has been made in improving global health status, and the difficulties yet to be overcome. The importance of "partners in health," as opposed to the solitary research worker, in reaching the current health needs is emphasized. Study includes an examination of the contributions of WHO, UNESCO, UNICEF, and FAO.

HSL 3504 Environmental Health

A review of the regional, national, and international status of the environment and its impact upon individual and community health. Major focus is on developing an understanding of the etiology of

environmental problems such as overpopulation, pollution of air and water, radiation exposure, noise, and waste disposal.

HSL 3505 Consumer Health

Analysis and evaluation of the concepts involved in the careful selection of health products and services. Areas for student exploration and study projects include decision making relative to the selection of health products and services, evaluating advertising, quackery, and protection against useless or dangerous products through consumer organizations.

HSL 3506 Nutrition

A study of dietary nutrients and their influence on the health status of individuals at various stages of the life cycle. *Prereq.: Anatomy and Physiology or permission of instructor.*

HSL 3600 Administration of Physical Education and Athletics

Physical education and athletics discussed as an entity consistent with the current emphasis on unity, economy, and equal opportunity. Modern practices and principles of general administration applied to problems of staffing, scheduling, budgeting, collective bargaining, personnel welfare, program development, and public relations. All levels of education and the broad spectrum of programs common to physical education and athletics are considered.

HSL 3605 Problems in Contemporary Athletics for Men and Women

Current problems, practices, and national issues pertinent to the conduct of athletic competition. National, state, and conference organizations are studied.

HSL 3606 Applied Evaluation in Curriculum and Instruction

Application of current educational evaluation theory to concepts of instruction and curriculum development in physical education. Includes formative and summative measures applied to the improvement of instruction, assessment of process and product in the educational program, interaction analysis. *Prereq.: HSL 3501.*

HSL 3608 Advances in Instructional Concepts

Current practices in, and a search for new approaches to instruction in physical education. Includes analysis of teaching and learning styles, available instructional technology, and the implementation of instructional designs in physical education classes.

HSL 3609 Physical Education for Students with Special Needs

Study of the movement problems and characteristics of special-needs populations. Assessment, planning, instruction, and evaluation practices recommended for work with special-needs students in physical education classes. *Prereq.: Adapted Physical Education or permission of instructor.*

HSL 3610 Management of Adapted Movement Performance Programs

Analysis of legal, behavioral, and environmental concepts related to specialized physical education/motor development programs and investigation of national management systems. *Prereq.: HSL 3609 or HSL 3442 or equivalent graduate course.*

HSL 3615 Anatomic Kinesiology

An examination of the human musculoskeletal system with respect to the internal and external forces acting upon the human body. Application of principles of statics and dynamics will be made in the areas of sport and sports medicine. *Prereq.: Kinesiology or permission of instructor.*

HSL 3616 Mechanical Analysis of Sport

Application of mechanics of motion will be made to human motion. This course will provide an overview of the methodology of human motion analysis. Emphasis will be placed upon the use of film and video in teaching, coaching, clinic, and human motion research. *Prereq.: HSL 3615 Anatomical Kinesiology.*

HSL 3617 Physical Fitness Appraisal and Guidance

Principles and procedures used to administer laboratory and field tests of cardiovascular endurance, body composition, joint flexibility and muscular strength, power, and endurance. Principles and procedures used to develop conditioning programs to improve these parameters. Focus will be on the low-risk individual in nonclinical settings. *Prereq.: Exercise Physiology or permission of instructor.*

HSL 3618 Exercise in Cardiovascular Health and Disease

Role of exercise in cardiovascular health and disease including: acute and chronic effects of exercise upon the cardiovascular, respiratory, metabolic, and muscular systems of the healthy and diseased individual. Principles of human performance assessment and exercise prescription applied to adults in exercise-based prevention, intervention, and rehabilitation programs. *Prereq.: Exercise Physiology or Advanced Physiology.*

HSL 3619 Electrocardiography

A study of basic and intermediate electrocardiography, including cardiac function, lead systems, rate, rhythm, axis, infarction, ischemia, hypertrophy, effects of cardiovascular drugs, and purposes and principles of exercise testing. *Prereq.: HSL 3618.*

HSL 3620 Laboratory in Exercise Testing and Prescription

Practicum in clinical graded exercise testing including determination of EKG, blood pressure, pulmonary, and metabolic response to exercise, and prescription of exercise for at-risk to high-risk persons in cardiopulmonary prevention, intervention, and rehabilitation programs. Students are expected to do clinical fieldwork as exercise test technicians and

exercise program leaders in prevention and/or rehabilitation programs and to conduct a project. *Prereq.: HSL 3618 Exercise in Cardiovascular Health and Disease, HSL 3619 Electrocardiography (HSL 3619 may be taken concurrently).*

HSL 3621 Advanced Cardiovascular Physiology

A review of the current knowledge of cardiovascular function relating the physiology of the circulatory system in its normal, diseased, and stressed states. The interaction between the components of the system will be emphasized. Current research topics will be covered. *Prereq.: HSL 3618 Exercise in Cardiovascular Health and Disease.*

HSL 3622 Cardiovascular Pharmacodynamics in Exercise Physiology

A study of the current medications used in the treatment of congestive heart failure, coronary artery disease, arrhythmias, angina, and hypertension; the effects of these medications during acute and chronic exercise; and cardiac emergency medications. *Prereq.: HSL 3619 Electrocardiography and PTH 3500 Cardiopulmonary Pathophysiology.*

HSL 3625 Trauma Assessment and Treatment in Sport

An investigation of injury pathology, evaluative testing, diagnosis, and appropriate treatment modalities. *Prereq.: Undergraduate Athletic Training or experience.*

HSL 3626 Reconditioning in Sports Injury

Rehabilitation procedures and techniques appropriate to the post-injury retraining of athletes. *Prereq.: Adapted Physical Education or permission of instructor.*

HSL 3630 Perceptual-Motor Development

A survey of the development of movement control from birth to maturity. Changes in motor performance due to age, motor development expected at various stages, and the interrelations of such factors as growth, social context, cultural expectation, motor abilities, and sequential changes in motor control are examined.

HSL 3631 Movement and the Learning Process

An examination of the scientific method as applied to the learning and performance of motor skills. The course surveys a range of theoretical positions and includes laboratory experiences as well as the interpretation of motor-learning studies. Major variables affecting motor learning and performance are examined from several theoretical standpoints. *Prereq.: HSL 3630 Perceptual-Motor Development or permission of instructor.*

HSL 3632 Early Childhood Motor Patterns

An examination of observational and experimental aspects of developmental motor learning. The sequential development of motor skills and various factors contributing to motor control development, as well as current issues in movement development, are studied. *Prereq.: HSL 3631 Movement and the Learning Process or permission of instructor.*

HSL 3640 Comparative Physical Education

Both past and present philosophies and practices of national and international programs in physical education are compared. Historical analysis is introduced as a research technique.

HSL 3641 Philosophies in Physical Education and Sport

An exploration of major philosophies, past and present, and their influence on modern physical education and sport. Students are expected to delineate their personal philosophies, explore philosophical analysis as a research technique, and review philosophical research. *Prereq.: Philosophy, Philosophy of Education, or permission of instructor.*

HSL 3642 Sociology of Sport

An analysis of the sociological principles and factors operative in the interaction between sport and society. Pertinent literature and research are reviewed. Topics of discussion include the pervasiveness of sport, social stratification, politics, economics, sport and the mass media, race, women, violence, competition, deviance, subcultures, and sport in the future. *Prereq.: General Psychology or permission of instructor.*

HSL 3643 Psychology of Coaching and Sport

The psychodynamics of the athlete and the coach, with particular reference to personality, maturation, motivation, learning, emotions, and perception. Individualized projects are required. *Prereq.: General Psychology or permission of instructor.*

HSL 3650 Planning and Developing Facilities for Physical Education and Recreation

The principles, terminology, and standards for planning, constructing, and using indoor and outdoor facilities for physical education and recreation. Integrated planning among all municipal departments is stressed.

HSL 3651 Supervision of Professional Personnel

Study of ways of effectively matching the needs of individuals with those of the organization. Emphasis on leadership, conflict resolution, and evaluation from an organizational development perspective.

HSL 3652 Critical Thinking and Evaluation in Physical Education and Recreation and Leisure Studies

Investigation of the acquisition of knowledge in two disciplines. Examination includes evaluating knowledge and practice through experiences in decision making, logical analysis, and critical thinking.

HSL 3653 Legal Issues in Recreation and Sport (3 Q.H.)

Analysis of recreation and sport from legal, social, and economic standpoints. Emphasis on the impact of law and legal principles on recreation and sport.

HSL 3655 Facilities and Operations Management (3 Q.H.)

Study of the day-to-day work required of operating managers in selected leisure industry settings. Particular emphasis is placed on how computer

technology and human relations can best be used to carry out the operations of an organization.

HSL 3820 Practicum in Clinical Recreation

A minimum of seventy-five clock hours of supervised professional experience, required of those students who do not have a degree in Recreation and Leisure Studies or sufficient professional work experience. Students are assigned as interns to agencies or institutions that offer services in the area of therapeutic recreation and rehabilitation, community and municipal recreation, or commercial recreation. Credit not applicable toward degree.

HSL 3822, 3823 Seminar/Workshop

Special seminars or workshops in recreation and leisure studies on topics of timely interest. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's

approval. A maximum of eight quarter hours earned in seminars or workshops may be applied toward the degree.

HSL 3894 Independent Study

Under the guidance and direction of a program adviser, students have the opportunity to develop and conduct projects related to their professional interests. *Prereq.: written proposal and permission of program adviser.*

HSL 3898, 3899 Seminar/Workshop

Special seminars or workshops in physical education on topics of timely interest. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's approval. A maximum of eight quarter hours earned in seminars or workshops may be applied toward the degree.

Speech-Language Pathology and Audiology

SLA 3600 Neurological Bases of Communication

This course will provide the student the opportunity to acquire a basic understanding of neuroanatomy and neurophysiology as they relate to normal aspects of speech, hearing, and language.

SLA 3601 Advanced Study in Articulation Disorders

An exploration into advanced theories of normal and abnormal phonological development with emphasis on distinctive theory and on phonetic theories of speech production; direct application of theories to diagnosis and treatment of various phonological disorders. *Prereq.: Undergraduate course in articulation disorders and permission of instructor.*

SLA 3602 Differential Diagnosis in Speech and Language Pathology

This course is designed to offer students the opportunity to learn formal and informal test procedures. *Prereq.: SLA 3603 Test Procedures in Speech and Language Pathology or permission of instructor.*

SLA 3603 Test Procedures in Speech and Language Pathology

The course is designed to offer students the opportunity to develop competence in administering and interpreting a variety of tests used in diagnosing communication disorders. Information relative to the case history and interview, as well as to formal test procedures and report writing, will be included. *Prereq.: Permission of instructor.*

SLA 3604 Language Disturbances in Children

This course will emphasize current theories in language behavior and their practical application to the assessment and remediation of language disturbances in children. Lectures, discussions, and case presentations may focus on the following issues: what constitutes a language problem, what assessment tools and therapeutic techniques are currently available, and what underlying principles are involved in selecting and organizing the content of a remediation program. *Prereq.: SLA 3602 Differential Diagnosis in Speech and Language Pathology, SLA 3603 Test Procedures in Speech and Language Pathology, or permission of instructor.*

SLA 3605 Aphasia Rehabilitation

Emphasis on current attitudes toward therapy and new methods, clinical methods of evaluation which are preparatory to therapy, and observation of therapeutic methods. *Prereq.: SLA 3600 Neurological Bases of Communication and permission of instructor.*

SLA 3606 Clinical Management in Stuttering

This course will emphasize diagnostic techniques, a review of the current therapeutic approaches, consideration of the individual's need in therapy, and the process of behavioral and attitudinal change from within a psychodynamic framework. Also to be considered are termination, referral, and group therapy. *Prereq.: Permission of instructor.*

SLA 3607 Seminar: Speech Science

Study focuses on current physiological, acoustical, and perceptual data used to describe both normal and disordered speaking populations. Research techniques and instrumentation in the field of speech science are also examined. The application of theoretical information from speech science to the diagnosis and treatment of communicative disorders is discussed. *Prereq.: SLA 3875 and SLA 3876 Advanced Clinical Practice I and II.*

SLA 3608 Seminar: Voice Disorders

Etiology, symptomatology, and disorder complexes related to phonation. Special emphasis is placed on the philosophy and methods used in the assessment and treatment of voice disorders. *Prereq.: SLA 3602 Differential Diagnosis in Speech and Language Pathology and SLA 3603, Test Procedures in Speech and Language Pathology.*

SLA 3610 Audiology for Speech-Language Pathologists

This course provides speech-language pathology majors a review of standard procedures and an update of contemporary issues in audiology. Study focuses on pathological disruption of the auditory system and on assessment procedures currently applied and their relationship to patient management and treatment plans.

SLA 3620 Clinical Audiometry I

The course presents an in-depth examination of the various uses of pure tone, speech, and impedance measures as they relate to the standard audiological assessment. Case history and case reporting are covered. *Prereq.: Introduction to Audiology or consent of instructor.*

SLA 3621 Medical Perspective to Anatomical Correlates in Audiology

This course provides the student with the opportunity for hands-on experience with dissection of human temporal bones as an approach to learning temporal bone anatomy; physiology and neurology are stressed. Students may become familiar with dissection techniques, use of dissecting microscope, and will be required to observe actual surgical procedures in a hospital. *Prereq.: Permission of department chairperson.*

SLA 3622 Pathologies of the Ear

Lectures and observations in the organic and neurological pathologies of the ear, e.g., otitis media, Meniere's disease, and otosclerosis. Consideration of approaches to treatment (medical setting). *Prereq.: Permission of instructor.*

SLA 3623 Clinical Audiometry II

The course examines in detail the site of lesion test battery approach to differential diagnosis in audiology. Specific topics include Bekesy, ENG, SISI, tone decay tests, ABLB, acoustic reflex, and auditory evoked potentials (ABR). *Prereq.: SLA 3620 Clinical Audiometry I or consent of instructor.*

SLA 3624 Clinical Audiology

Physical characteristics of hearing aids and their performance. Theoretical approach to selection and fitting of hearing aids, and analysis of hearing aid dispensing systems. *Prereq.: Introduction to Audiology and permission of instructor.*

SLA 3625 Psychosocial Aspects of Communication Disorders

This course is concerned with the psychological, educational, and social aspects of communication disorders, particularly auditory impairment. *Prereq.: Permission of instructor.*

SLA 3626 Seminar in Audiology

Advanced study of the development of principles and theories associated with modern procedures and methods used in audiology. *Prereq.: Permission of instructor.*

SLA 3628 Psychoacoustics

This course offers the student the opportunity to explore the relationship between acoustic stimuli and psychological responses to sounds. Particular emphasis is placed on the similarities and differences in the perception of normal hearing and among different types of impaired hearing. Major topics of study include a general review of the physics of sound, detection, discrimination, masking, binaural hearing, and speech perception. *Prereq.: Permission of instructor.*

SLA 3629 Aural Rehabilitation

Various approaches to speechreading and auditory training are examined in detail as they apply to children and adults. The course provides an integrated approach to management of hearing-impaired individuals. *Prereq.: Introduction to Audiology.*

SLA 3640 Cerebral Palsy

Neuromuscular involvements and concomitant language and speech disorders; intellectual deficits, psychological aspects, communicative disorders of a cerebral palsied population; testing, placement, and management of the cerebral palsied child with emphasis on a multidisciplinary approach. *Prereq.: Permission of instructor.*

SLA 3641 Physiological Acoustics

Particular emphasis is placed on the biophysics of the hearing mechanism, especially in terms of actual clinical utility. Comparative anatomy and physiological analysis are stressed. *Prereq.: Introductory courses in Speech and Hearing, and permission of instructor.*

SLA 3642 Seminar: Orofacial Anomalies

Etiology, symptomatology, and problems associated with orofacial anomalies. Emphasis will be placed on the speech, language, and hearing characteristics and the assessment and treatment of persons with orofacial anomalies. Psychological and social considerations and analysis of the team habilitative effort will be presented.

SLA 3643 Seminar in Speech Pathology

Individual research and/or critical review of the literature in some area of basic science, speech sound learning, language, voice, fluency, or multiple disorders, with special emphasis on the impact of deafness on psychosocial development. Class presentation of material and class discussion may be included. *Prereq.: Open to graduate students who have completed the equivalent of two quarters of graduate work in Speech Pathology and have the instructor's permission.*

SLA 3645 Neuropathology

Application of functional neuroanatomy in comprehending the various disease processes involving the nervous system; cerebrovascular disease tumors or malformations, Parkinson's disease, multiple sclerosis, and others. *Prereq.: Permission of instructor.*

SLA 3647 Hearing Science Seminar

Individual research and/or critical review of the literature in the area of bone conduction of auditory signals, evoked response and audiometry, impedance and audiometry, cortical processing of auditory input, and other related topics. Students will be responsible for class presentations of researched material. *Prereq.: Permission of instructor.*

SLA 3650 Medical Perspective to Anatomical Correlates in Speech Pathology

This course will provide the opportunity for hands-on experience with dissection of human larynxes as an approach to learning voice tract anatomy. Students may become familiar with dissection techniques, use of dissecting microscope, and may have an opportunity to observe actual surgical procedures in a hospital. *Prereq.: Permission of department chairperson.*

SLA 3651 Social Dialectology: Theoretical and Educational

This course focuses on the social and cultural influences on the language behavior and communication needs of the culturally "different" child. It emphasizes the interrelationship between linguistic structure and social structure and its implications for clinical intervention. *Prereq.: Permission of instructor.*

SLA 3652 Behavior Modification: Operant Procedures in Speech and Language Training

This course reviews principles and procedures of the functional analysis of behavior and focuses upon the application of behavioral theory and research to speech, language, and hearing training. It emphasizes clinical investigation in the experimental analysis of behavior of communication disorders and

experiences in the application of experimental procedures in assessment and treatment programs. *Prereq.: Permission of instructor.*

SLA 3653 Seminar: Communication Disorders

This course provides an exploration into the development of communication and communication disorders, with focus on early conversational interaction, children's discourse, and pragmatic intents. Emphasis is placed on deficient social bases and their effect on language performance as well as trends for clinical procedures and intervention strategies for language-disordered children. Communication is viewed as the ultimate goal of therapy. Course participants are expected to complete a research project on the development of communication and child discourse and its application to clinical assessment and intervention.

SLA 3690 Seminar in Normal Language Acquisition

This seminar will assess current theories and designs of studies of language acquisition and processing from infancy through adolescence. Special problems in data collection and analysis in the various areas of child language will be discussed through lectures, student presentations, and discussions of current research. Methodology, data, and results of current research and their significance to theories of language acquisition will be critiqued using videotaped and audio-taped data samples. Each student will be expected to write a research proposal to investigate a specific topic in language acquisition.

SLA 3691 Sociolinguistics

This course will consist of basic sociolinguistic concepts including dialectal variation and other forms of language variation, attitudes toward language use and the speech community; language needs of multicultural children in educational settings, considering cultural attitudes of teachers and types of learning situations available; and social and cultural diversity and its effects on the individual's communicative competence. Also included will be methods of sociolinguistic research that will lead to the student designing a language study for application in: discourse analysis; language in the classroom; sociolinguistic effects on reading, writing, oral language, and role relationships.

SLA 3698 Workshop in Speech Pathology and Audiology

(See general workshop description on page 00.)

SLA 3699 Institute in Speech Pathology and Audiology

(See general institute description on page 00.)

SLA 3800 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Not available to special students. *Prereq.: Approval of the chairperson of the department and of the director of the graduate school.*

(Approval forms must be submitted during the quarter prior to registration of the Directed Study.)

SLA 3801 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

SLA 3875 Advanced Clinical Practice I 2 Q.H.

A two-quarter sequence of supervised clinical experience in speech pathology and audiology designed for beginning graduate students. Practicum sites include the Northeastern University Hearing, Language, and Speech Clinic; satellite clinics; and/ or educational settings. Students must be available a minimum of two days per week during the academic year. This course also requires attendance at on-campus seminar meetings held weekly. *Prereq.: Departmental permission and GPA of 3.0.*

SLA 3876 Advanced Clinical Practice II 3 Q.H.

A two-quarter sequence of supervised clinical practicum in speech pathology and audiology at the Northeastern University Hearing, Language, and Speech Clinic; medical settings; educational settings; and rehabilitation centers. Practicum experience emphasizes advanced diagnostic and management techniques stressing the application of theory to practice. Students must be available a minimum of two days per week during the academic year. *Prereq.: Departmental permission and GPA of 3.0.*

SLA 3877 Advanced Clinical Practice III 3 Q.H.

A two-quarter sequence of supervised clinical practicum in speech pathology and audiology designed for advanced graduate students. Practicum experience emphasizes problem-solving techniques relevant to case management. Students must be available a minimum of two days per week during the academic year. *Prereq.: Departmental permission and GPA of 3.0.*

Interdepartmental Courses

INT 3500 Research Design and Methodology

Research methods and designs used in health education, physical education, physical therapy, and recreation education. Emphasis is placed on the development of research techniques, including the ability to define research problems; write hypotheses; review and interpret literature; apply research designs; organize, analyze, and present data; and draw relevant conclusions. *Prereq.: Statistics or permission of instructor.*

INT 3540 Computer Applications for Nonprofit Organizations 3 Q.H.

An introductory course which presents ways in which generic software packages (database management, spreadsheets, business graphics, and word processing) may be used to improve efficiency and effectiveness of individuals and organizations. Hardware and software configurations are discussed.

INT 3549 Introduction to Computer Programming: FORTRAN

A laboratory course designed to develop facility in the use of a wide range of data-processing equipment in educational research. Students will be introduced to the basic principles of computer programming, but emphasis will be placed on the applicability and use of existing statistical programs.

INT 3550 Instruction in LOGO

Philosophy and programming in the LOGO language form the primary emphases. Curriculum materials are demonstrated showing the use of the LOGO language in areas such as computer programming, mathematics, and language arts. Current research and applications of LOGO in the school curriculum

are presented. Creation of individual LOGO projects in laboratory settings are required.

INT 3551 Instructional Programming in PASCAL

An introduction to computers and computer programming using the language PASCAL. Tools such as text editors are also discussed. Instructional applications are made where possible.

INT 3552 Computer Use for Educators 2 Q.H.

Designed for educators with minimal computer experience, this course provides an introduction to word processing, data processing and file management. Functions of the operating system and the physical hardware are discussed. The BASIC programming language will be introduced. Students will have extensive hands-on experience in class and through accompanying supervised laboratories.

INT 3553 Word Processing for Educators 2 Q.H.

A variety of word processing software programs are taught. Applications of word processing ranging from simple one-page letters to documents and mail-merge are considered in this course. Students will have extensive hands-on experience with computers in class and through accompanying supervised laboratories.

INT 3554 Computers in Education

This course will focus on the use of computers both as a teaching methodology and as an administrative tool in education. The use of Computer Assisted Instruction (CAI) will be introduced through the BASIC programming language. A variety of microcomputer software packages suitable for classroom and administrative use will be tested in a laboratory setting.

Extensive hands-on experience with a number of commercially available educational software packages is required. Strategies and methods for integrating computing within the elementary and secondary curriculum are highlighted.

INT 3555 Introduction to Computer Use for Professionals

Introduction to computer capabilities and limitations; selection of hardware/software; use of a line editor; introduction to system command language; and introduction to data processing through a packaged library program such as SPSS, BDMP, MINITAB or IMSL.

INT 3556 Educational Applications of DBMS

Several general purpose software packages (database, spreadsheet, and data analysis) and simulations are used for working through such problems as scheduling/facilities usage, recordkeeping and general ledger/accounting, and survey/market research.

INT 3557 Instruction in LOGO II

This course represents a second course in the LOGO environment, emphasizing advanced concepts in

LOGO, including the use of list-processing in language, music, physics, and mathematics. *Prereq.: INT 3550.*

INT 3501 Thesis/Project I

Initiation of a scholarly investigation. Students are required to submit a written research proposal for approval by a thesis/project committee and to present an oral proposal at a college seminar. *Prereq.: ED 3340, INT 3500, completion of two courses in area of concentration, and permission of program adviser.*

INT 3502 Thesis/Project II

The investigation proposed in Thesis/Project I implemented with, and culminating in, an approved written report in thesis form. *Prereq.: INT 3501 Thesis/Project I.*

INT 3503, 3504 Seminar/Workshop

Special seminars or workshops on interdepartmental topics of timely interest. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's approval. A maximum of eight quarter hours earned in seminars or workshops may be applied toward the degree.

Institutes

ED 3828, ED 3825, ED 3826, ED 3827, CRS 3803, SLA 3699, CRS 3805, CRS 3804, HSL 3898, HSL 3822

A department may offer a special institute in a specific field of interest from time to time. The institute may be collaborative, offered by the several departments in the Boston-Bouvé College of Human Development Professions, and will usually include a special institute faculty drawn from resources outside the University, as well as from the Boston-Bouvé faculty. The institute focuses on a specific area of academic study and may be interdisciplinary in nature; it involves total time commitments on the part of participants in morning, afternoon, and evening

sessions, five or six days per week, for one to eight weeks, depending upon the nature and scope of the institute. Institutes are customarily designed for participants who are currently employed in a common field of work and wish to receive additional preparation in new methods, new materials, and new content areas. Graduate credit may be granted for successful completion of an institute but may not be applied toward a degree program at the University without the approval of the departments in which students are doing their major field of specialization degree work. All institute participants must be degree candidates in the graduate school or must qualify, prior to registration, as special graduate students. *Prereq.: Permission of institute instructor.*

Workshops

ED 3820, ED 3821, ED 3822, ED 3823, CRS 3806, SLA 3698, CRS 3807, HSL 3899, HSL 3823

A department may offer a special workshop in a specific field of interest from time to time. Emphasis in the workshop is focused on the development of instructional materials or the resolution of practical problems with a single school or institutional setting. Workshops may also be held for a group of potential participants who are currently employed in a common

field of work. Graduate credit may be granted for successful completion of a workshop but may not be applied toward a degree program at the University without the approval of the departments in which students are doing their major field of specialization degree work. All workshop participants must be degree candidates in the graduate school or must qualify, prior to registration, as special graduate students. *Prereq.: Permission of workshop instructor.*

Professional Accounting

Graduate School of Professional Accounting

ACC 3401 Accounting Problems I 5 Q.H.

An accelerated introduction to the basic accounting process and the preparation of general-purpose financial statements. Specific topics covered include cash, investment, receivables, inventories, current liabilities, and present value concepts. Completion of a self-instructed, programmed text on the basic accounting concepts is a prerequisite.

ACC 3402 Cost Accounting Theory and Problems 5 Q.H.

Specialized problems of cost accumulation and cost behavior are analyzed. Specific topics covered include: cost-volume-profit analysis, standard costs and budgeting, overhead analysis, and capital budgeting. Costs involved in managerial decision-making are given special attention.

ACC 3404 Accounting Problems II 5 Q.H.

A continuation of ACC 3401 including coverage of the following topics: land, property and equipment, depreciation, long-term liabilities, stockholders, equity, earnings per share, and accounting for income taxes.

ACC 3405 Accounting Problems III 5 Q.H.

An examination of specialized accounting topics including pensions, leases, accounting changes, statement of changes in financial position, partnerships, and government accounting.

ACC 3406 Advanced Accounting Problems 5 Q.H.

An examination of business combinations including the purchase and pooling methods. Specific topics covered include: intercompany profits, indirect and reciprocal holdings, and foreign currency translations.

ACC 3407 Auditing Theory and Practice 5 Q.H.

An examination of auditing concepts, standards, and procedures. Topics covered include: the legal and ethical responsibilities of the auditor, statistical sampling, auditing and EDP, audit reports, and audit procedures. Attention is given to the nature and objectives of the audit process.

ACC 3408 Federal Income Tax Accounting 6 Q.H.

A comprehensive study of the Internal Revenue Code, regulations, revenue rulings, and relevant cases. Emphasis is placed on taxation of individuals, corporations, partnerships, estates and trusts, tax-planning and tax research.

ACC 3413 Contemporary Accounting Theory 5 Q.H.

An examination of current concepts, issues and trends in accounting that are of greatest interest to the accounting profession. Authoritative pronouncements of various accounting organizations are examined.

FIN 3414 Management of Financial Resources 5 Q.H.

Emphasis is on the financial management of corporations and the principles governing the effective

management of capital. The various sources of funds—short-, intermediate-, and long-term—are discussed in detail, using selected cases for illustrative purposes. Financial institutions such as the Securities and Exchange Commission (SEC), and the securities markets are also studied.

HRM 3403 Organizational Behavior 5 Q.H.

An examination of behavior in business organizations. The information presented is also applicable to nonprofit organizations such as schools, government agencies, and hospitals, including community groups, and social clubs. Students are given an opportunity to acquire knowledge of behavior and to develop skill in dealing with it, and as they hope to affect and change it.

MEC 3412 Managerial Economics (Quantitative Approach) 5 Q.H.

Decision-making under conditions of uncertainty: allocation of scarce resources, utilizing linear programming models, determination of the value of a marginal unit of a scarce resource (concept of shadow price), sensitivity analysis, examination of the most frequently encountered sampling distributions, determination of optimal decision rules, and economic models for estimating demand-and-cost relationship.

MGT 3415 Business Law 5 Q.H.

Contracts, partnerships, corporations, agency, commercial paper, sales, and other topics essential for professional development in the business and legal environment are examined.

MGT 3416 Business Policy in a Societal Setting 5 Q.H.

Case studies are used to focus on business decisions confronting management. Policy decisions and their impact on various sectors of society, such as stockholders, customers, suppliers, the public and government are examined.

MKT 3410 Marketing 5 Q.H.

An introduction to managing the marketing activities of an organization, examining the basic marketing management systems: marketing research, the marketing organizational system, and the marketing planning and control system. Topics include customer/client analysis, market research, product/service planning, pricing, communications, advertising and sales promotion, distribution management, and the development of strategies. This course relies mainly on case study discussions of actual marketing decisions, supplemented by lecture and readings.

MSC 3409 Operations Management 5 Q.H.

An introduction to the organization and management of production systems. The three major types of production systems, flow, job, and project, are discussed with special emphasis given to capacity, scheduling, inventory, and control.

MSC 3411 Information Systems**5 Q.H.**

A nontechnical introduction to computers and information systems, focusing on issues relevant to audit and control. The first portion of the course delves into basic computer and information-systems concepts, including computer hardware, software, and systems development. Following this aspect, emphasis is placed on managing, planning, and controlling the computer resource, security and privacy issues, and computer auditing. Students will be expected to have become familiar with elementary computer programming and the use of Northeastern's time-sharing terminals.

MSC 3420 Computer Programming:**0 Q.H.****An Introduction**

The Information Systems course (MSC 3411) scheduled for the spring quarter, as well as several other courses in the program, assume basic competency on computers, including the ability to write simple programs and to use off-the-shelf software packages (such as Lotus and Wordstar) for financial analysis and word processing. This noncredit course is offered in modules to provide the necessary background for students lacking adequate preparation in one or more of these areas. Offered on a pass-fail basis, the course may be waived by permission of the instructor.

Computer Science

Graduate School of Computer Science

Please note: All courses have COM 1201, Data Structures, as a prerequisite, in addition to those listed.

COM 3112 LISP 2 Q.H.

An introduction to LISP for computer scientists, with emphasis on the use of LISP in Artificial Intelligence.

COM 3114 C/UNIX Lab 2 Q.H.

An introduction to the C programming language. Students will become readers and writers of the language, learn to use UNIX commands and application programs, UNIX system calls and subroutines.

COM 3115 PROLOG 2 Q.H.

This course will cover PROLOG syntax; data structures; backtracking and "cut"; debugging; applications; relation of PROLOG to logic.

COM 3200 Computer Architecture 4 Q.H.

Organization of machines and computations. Computer System capacity. Processors. Control units. Memories and memory hierarchies. Interconnection networks. Different computer architectures are studied by examining the corresponding languages and assemblers. *Prereq.: COM 3336.*

COM 3205 Software Design and Development 4 Q.H.

Students work in groups to organize, manage and implement a large scale programming project. Topics considered are: software planning; software methodologies, e.g., functional decomposition, data flow design, data structure design, programming calculus; several large examples of program design; software testing and reliability.

COM 3315 Database Systems Design 4 Q.H.

Concepts and structures necessary to design and implement a DBMS application. Introduction to database concepts. Database modeling. Hierarchical, network and relational models. Data definition and manipulation languages. Design theory for relational models. Query optimization. Integrity, security, recovery and concurrency in database systems.

COM 3316 Database Engineering and Management 4 Q.H.

Specification, design and implementation of a simple DBMS. Practical database design issues and methodology. Discussion of conceptual implementation and physical design. Techniques to evaluate design alternatives and tradeoffs. Analysis of primary and secondary access methods for performance of database operations and for storage space. *Prereq.: COM 3315.*

COM 3336 Operating Systems 4 Q.H.

Design and implementation of an operating system. Algorithms for concurrent processes, deadlock resolution, process management, performance evaluation and monitoring. Students work on a project implementing a small operating system or extending an existing one. *Prereq.: COM 1130.*

COM 3350 Theory of Computation 4 Q.H.

Formal models of computation including Turing machines and partial recursive functions; Turing-decidability and unsolvable problems. Computational complexity, the class P and NP, some NP-complete problems. *Prereq.: COM 1350 and COM 3390.*

COM 3351 Principles of Programming Languages 4 Q.H.

Basic components of programming languages. Specification of syntax and semantics. Derivation of languages processors from their specifications. Description of programming language features. Examples from a variety of languages.

COM 3355 Compiler Construction I 4 Q.H.

Advanced concepts and principles of compiler design including an overview of compiler structures. Topics also cover: syntax-directed compilation, translation and interpretation, the relation between syntax and semantics, the relation between high level programming languages and compilers, between finite state machines and lexical analysis, between context-free languages, parsing trees and the syntactic specification of programming languages and some parsing techniques such as shift-reduce parsing, operator-precedence parsing, top-down parsing and predictive parsers. Selected current research papers and articles are used as references. *Prereq.: COM 3351.*

COM 3356 Compiler Construction II 4 Q.H.

Further investigations of compiler construction including principles of syntax-directed translation, simple SDTS and top-down transducers, simple postfix SDTS and bottom-up transducers. Topics like bottom-up parsing, LR(k), LALR parsing, code generation, symbol table structures, error detection and recovery and code optimization are also discussed. Selected current papers and articles are used for discussion. *Prereq.: COM 3355.*

COM 3370 Advanced Computer Graphics 4 Q.H.

Selected advanced topics in computer graphics chosen from the following list: area fill algorithms, the aliasing problem in line drawing, 3 dimensional graphics, geometric transforms, hidden surface algorithms, curve and surface approximation techniques, solid primitives, color and shading, approaches to obtaining realistic images. *Prereq.: An introductory course in computer graphics.*

COM 3390 Analysis of Algorithms 4 Q.H.

Design and analysis of fast algorithms. Topics are chosen from: 1) Advanced data structures: representing partitions, union-find algorithms, priority queues; 2) Graph algorithms: biconnectivity, maximum flow, shortest path, matching, minimum spanning tree; 3) Algebraic problems: Matrix multiplication, polynomial multiplication, string matching, linear

programming; 4) Probabilistic algorithms: tests for primality, factoring polynomials and integers. *Prereq.: MTH 1137.*

COM 3410 Foundations of Artificial Intelligence 4 Q.H.

Searching, goals, and plans. Heuristics. Representation of knowledge: nets, frames, and inheritance. Logic and its role in Artificial Intelligence. Selected applications of these ideas in other areas of Artificial Intelligence. *Prereq.: Working knowledge of LISP.*

COM 3411 Methods of Artificial Intelligence 4 Q.H.

Hands-on experience in the development and use of AI tools such as: search with backtracking (chronological, dependency-directed) and heuristic search, blackboard models, default reasoning, inference engines (unification and resolution), object-oriented programming (flavors and Loops), procedural attachment, plan-generate-test in problem solving, production systems, rule spaces, distributed representations, augmented transition networks and their compilation. *Prereq.: COM 3410.*

COM 3420 Knowledge Representation and Inferencing 4 Q.H.

Knowledge representation, acquisition and utilization. Frames, scripts, conceptual dependency. Forward and backward chaining, unification and resolution, non-monotonic reasoning. Rote learning, learning by analogy, consistency checking. *Prereq.: COM 1410 or equivalent.*

COM 3425 Logic in Artificial Intelligence 4 Q.H.

Formal logic as related to intelligence and human reasoning. Brief review of the formal properties of "standard" logic. Logic in Artificial Intelligence systems and languages. Limitations of standard logic as a model of intelligent behavior. Extensions of standard logic including modal/temporal logics, fuzzy logic, logic of action and belief, non-monotonic logic, and intensional logic. *Prereq.: COM 3411.*

COM 3430 Expert Systems 4 Q.H.

Introduction to Expert Systems and how to build them. Focus on techniques and tools, classical systems, and recent research in automated methods. Assignments introduce students to various languages and tools. A project or term paper is required. *Prereq.: COM 3410.*

COM 3440 Natural Language Processing 4 Q.H.

Goals and problems of Natural Language Processing (NLP). In-depth study of grammatical models and associated parsing algorithms. Models of natural language semantics: case grammar, semantic networks, formal logic, and frames. Current research on models of discourse, speech act planning, and robust parsing methods. Finally, we will examine some implemented systems for NL understanding. *Prereq.: COM 3410.*

COM 3450 Syntactic Pattern Recognition 4 Q.H.

Introduction to syntactic pattern recognition and comparison with the classical discriminant approach. A survey of various syntactic pattern recognition tech-

niques, such as PDL, array grammar, formal languages, tessellation structures. Syntax analysis as a recognition procedure. Grammatical inference for recognition. Applications to selected problems in industry, commerce, medicine, and robotics. *Prereq.: COM 1350.*

COM 3460 Intelligent Computer-Assisted Instruction 4 Q.H.

The notion of course material independent of teaching procedures. Problems and comments individualized for each student. System tutor with reactive learning environments. Examples for SCHOLAR and GUIDON. Group development of intelligent instructional systems.

COM 3470 Computer Vision 4 Q.H.

Low-level vision is described first. Then methods are developed which assemble the low-level elements into coherent wholes based on models of scenes using world knowledge in the appropriate domains. Topics include classification, robot vision, moving image analysis, and cognitive models of vision (gestalt effects, texture perception, subjective contours, illusions, apparent motion and mental rotations, cyclopean vision, etc.) *Prereq.: COM 3410.*

COM 3480 Connectionist Models of Learning 4 Q.H.

Machine learning with main emphasis on connectionist models. Possible topics include the notion of "concept", perceptrons and their limitations, learning from examples, Anderson's BSB model, autoassociative systems, spreading activation models, distributed representations, the neocognition of Fukushima, the pocket algorithm, the credit assignment problem and learning in networks, Boltzmann machines, Rumelhart's back propagation algorithm, tower construction, and connectionist expert systems. Students will lead discussions and prepare a project or term paper. *Prereq.: COM 3410.*

COM 3510 Computer Communication Networks: Design & Performance 4 Q.H.

A study of interacting computers. Topics include: elementary queueing theory, connectivity theory, data link and transport protocols, slot rings, token rings and CSMA, routing algorithms, performance analysis of networks. Additional topics may be chosen from models of networks or of network protocols, error detection and correction, applications protocols such as virtual terminal or file transfer protocols. *Prereq.: MTH 1137.*

COM 3520 Cryptography and Computer Security 4 Q.H.

Design and use of cryptographic systems and cryptanalytic attacks; a history of cryptographic systems and the mathematics behind them; shift register sequences; random number generators; DES; public key systems and their applications. *Prereq.: COM 1350, and MTH 1137.*

COM 3560 Distributed Database Systems 4 Q.H.

A consideration of the problems and opportunities inherent in distributed data bases on a network of

computer systems. Includes file allocation, directory systems, deadlock detection and prevention synchronization, query optimization, and fault tolerance. *Prereq.: COM 3315.*

COM 3570 Office Automation 4 Q.H.

The structure and impact of telecommunications and distributed processing on management information systems and decision support systems. Electronic mail systems, teleconferencing, and videotex. Micro-computer networks, network software, and operating systems. *Prereq.: COM 3510.*

COM 3580 Principles of Interactive Systems Design 4 Q.H.

Principles for optimal design of interactive systems such as text editors, programming environments, automated banking systems and commercial products for nontechnical users such as decision support systems, word processors, personal computers, etc. User characteristics which impact systems design. Impact of current technologies such as touch screens, mice and other pointing devices, sophisticated graphics, data integration, etc., on interaction style. Survey of styles of interaction including menus, command languages, forms fill-in. Object-oriented vs. application-oriented interfaces. Optimizing design tradeoffs.

COM 3585 Methods in Interactive Systems Design 4 Q.H.

Survey of the research and methodology in the design of interactive systems. Introduction to experimental methodologies applied in the study of styles of interaction: field studies, controlled laboratory experiments, protocol analysis. Survey and critique of research on various aspects of interaction such as dialogue style, filing and retrieval mechanisms, command languages, menu design, input devices, message and error handling and screen layout. *Prereq.: COM 3580.*

COM 3630 Concurrent Programming 4 Q.H.

The logical problems that arise in concurrency and their machine implementations. Mutual exclusion,

message passing, deadlock, monitors, kernels, and applications to operating systems. *Prereq.: COM 3336.*

COM 3640 Parallel Computation 4 Q.H.

Algorithms and theories for parallel computation on fixed-connection networks and on concurrent systems having a fixed number of processors. Included are algorithms for sorting, priority queues, graph algorithms, matrix multiplication, and FFT. Students use a network of micros to implement some of these algorithms. Applications to VLSI design may be included. *Prereq.: COM 3336, COM 3390.*

COM 3800 Readings in Computer Science 4 Q.H.

Selected readings under the supervision of a faculty member. *Prereq.: Core courses and permission of instructor.*

COM 3805 Readings in Computer Science 2 Q.H.

Selected readings under the supervision of a faculty member. *Prereq.: Core courses and permission of instructor.*

COM 3810 Special Topics in Computer Science

Faculty will lecture on current topics in computer science. Topics will vary from quarter to quarter. May be taken up to three times for credit, with changes in topics. *Prereq.: Core courses or permission of instructor.*

COM 3820 Computer Science Master's Thesis

May be repeated for credit. *Prereq.: Agreement of a thesis adviser.*

COM 3830 Computer Science Master's Project

May be repeated for credit. *Prereq.: Agreement of a project supervisor.*

COM 3840 Seminar in Computer Science

Students will read and present various survey and research papers in Computer Science. Faculty supervisor and topics will vary from quarter to quarter. May be repeated for credit. *Prereq.: Core courses or permission of instructor.*

Criminal Justice

Graduate School of Criminal Justice

The following course descriptions, listed numerically by area of concentration, are representative of the courses offered in the graduate Criminal Justice program. As it is not possible to offer all courses each year, students are urged to consult the most current announcement of course offerings for specific information regarding available courses in any given quarter. All courses described here carry three quarter-hours of credit.

CJ 3201 The Criminal Justice Process

This course is designed to introduce graduate students to the operation of the criminal justice system. It covers the components of the system, the process by which defendants are moved through that system, and key issues in the administration of criminal justice.

CJ 3202 Theories of Criminology

Focuses on the use of scientific methods in the study and analysis of regularities, uniformities, patterns, and causal factors related to crime, the criminal, and social reactions to both. Critical contributions to the study of crime, criminals, and the treatment of offenders are analyzed as they emerge from writings in such disciplines as biology, psychology, psychiatry, endocrinology, law, sociology, and anthropology.

CJ 3203 Criminal Law

The fundamental principles and concepts of criminal law in the United States. This course focuses on the relationship of the individual to the state and includes an examination of the general framework of criminal law.

CJ 3204 Statistical Analysis I

Introduction to probability and statistics. Topics to be covered include measures of central tendency and dispersion; probability and the binomial, Poisson, exponential, and normal distributions; sampling distributions and hypothesis testing; and correlation and regression.

CJ 3205 Evaluation Methods in Criminal Justice

Focuses on some of the nontechnical, yet crucial, research issues including ethical problems, the design, procedures, and politics of evaluation research in criminal justice, as well as funding sources and the generation and administration of grants and contracts. Students are expected to participate in evaluation exercises and to prepare proposal narratives and budgets.

CJ 3251 Criminal Justice Planning and Development

An examination of planning techniques and their impact on criminal justice program development, currently and for the future. An analysis of policy and decision making pertaining to criminal justice organizations and agencies is developed as is the extent of planning for crime control at local, state, regional, and national levels. The peculiar nature of urban problems in relation to planning is also reviewed, involving identifying problem areas in the field of criminal justice, diagnosing their causes, and formulating solutions. In addition, the course examines

alternative strategies and mobilization of resources necessary to effect change in the system.

CJ 3252 Criminal Justice Management

Examines the theory of management and applied skills in the field of management. Strong emphasis will be put upon the development of systems skills in getting people to work together to achieve a common objective. Students will be given the opportunity to develop their skills in applying the concepts of planning, managing, motivating, and controlling in a management environment. The major emphasis in the course will be upon the development of knowledge and skills in the area of situational analysis and problem solving in applying both systems theory and functional theory.

CJ 3253 Personnel and Labor Relations in Criminal Justice

This course helps to provide the student with basic skills in personnel management, selection, and placement. It is also intended to help students develop an understanding of the social psychology of organizations concerned with law enforcement, the courts, or corrections, and to help them develop familiarity with critical issues in labor relations and collective bargaining.

CJ 3254 Budget and Financing in Criminal Justice

The principles and practices of budgeting in the various functional areas of criminal justice. Financial operations are dealt with in depth, including such matters as obtaining resources through budget development and presentation. Distinctions between capital budgets and expense budgets and among zero budgeting, line-item budgeting, and program budgeting are drawn. Important financial concerns such as cost effectiveness, management by objectives, and critical path method (CPM) are discussed. Special attention is given to budget projections as planning tools for obtaining grants, as well as a means of facilitating needed change within the present structures of criminal justice agencies. The utility of budgets as evaluative mechanisms is stressed; and the role of budgeting in the financial control of organizations is discussed.

CJ 3301 Administration of Private Security

A comprehensive overview of private security theories, operations, and practices, with special emphasis on the administration and management of security. The philosophical background, history, and current role of private security are explored, as well as the role and status of the security manager in threat assessment, risk prevention, and the protection of

assets. Functional-area security systems, law, science and technology for security, and issues, standards, goals, and challenges for the future are dealt with in the course. Security systems are considered, particularly as these "open" systems related to criminal justice and the environment. The security manager is conceived of as the prime mover toward professionalization and improved management and administration of security operations, and as the advocate of contemporary organizational theories embracing research and the systems approach.

CJ 3302 Law and Private Security

The legal factors that affect security operations and administration and the value of legal counsel on such factors. These factors include the pertinent aspects of torts, agency, civil rights, contracts, trade secrets, patents and copyrights, insurance, and regulatory issues.

CJ 3303 Technological Security Systems

Considers security applications of the latest scientific and technological advances and the impact of new product developments on prevention and protection, detection, and prosecution. Students will examine the state of the art of security products and are invited to plan, implement, maintain, and evaluate highly sophisticated security systems.

CJ 3304 Human Factors in Security

An analysis of topics and strategies for security administration. Executive development, ethical issues, stress management, conflict management, crisis management, intra-organizational relations, community agency relations, promoting security awareness, staff development, and effective security personnel and product interface are addressed.

CJ 3351 Theories of Law and Society

An introduction to theories, issues, and research related to law and legal institutions, placing law in the context of social control systems, raising basic issues about the nature of law, and focusing on the relationship between law and social values. The course also considers the nature of law, law and social change, the sociology of the legal profession, and criminal law in action. Attention is given to the formulation of criminal law and discrimination in the formulation and practice of criminal law.

CJ 3352 Statistical Analysis II

A continuation of Statistical Analysis I. Multiple regression and its extensions, discriminant analysis, factor analysis, analysis of variance, and the analysis of contingency tables are discussed. *Prereq.: CJ 3204.*

CJ 3353 Research Methods in Criminal Justice

A survey of methodological approaches to criminal justice research. Various research strategies, including sample surveys, observation, historical research, experiments, and evaluation, are discussed and highlighted with examples from the literature. Also reviewed are various sources of criminal justice data with assessments of their reliability and validity.

Various data analytic strategies, including tabular analysis and nonparametric methods, are emphasized within the context of computer assignments.

CJ 3354 Criminal Behavior Systems

Designed to provide graduate students with an in-depth understanding of particular types of crime, this course aims to: 1) familiarize students with sociological approaches to the study of particular crime types; 2) acquaint students with research findings on specific criminal behavior systems; 3) provide students with the opportunity to explore, independently and in-depth, a criminal behavior system that particularly interests them.

CJ 3503 Criminal Evidence

An introduction to the field of criminal evidence. Students are expected to read and brief cases and must be prepared to discuss them in class. The readings, class lectures, and discussions help familiarize students with the various procedures and rules related to the trial of a criminal case.

CJ 3505 Juvenile Law and Children's Rights

An examination of the legal relationship between the juvenile offender and the state. The course covers case and statutory law, as well as constitutional due-process standards in juvenile proceedings. Areas covered include jurisdiction, prejudicial process, waiver of jurisdiction adjudication, disposition, and postdispositional issues, including right to treatment.

CJ 3506 Criminal Procedures

Constitutional issues of the administration of criminal justice. Topics to be considered include selected provisions of the United States Constitution, with particular emphasis on Amendments 4, 5, 6, and 14, and on questions of electronic surveillance, right to counsel, line-up, bails, and right to speedy trial.

CJ 3508 Quantitative Models in Criminal Justice

Quantitative frontiers in the field of criminal justice as well as the methodological contributions of allied fields are examined: in particular, such approaches as reliability models of recidivism, stochastic models of criminal behavior, econometric models of the criminal justice system, and deterrence models are addressed. An extensive coverage of published and unpublished literature is central to the course.

CJ 3509 Crime Measurement

The amount, distribution, and pattern of criminal behavior in the United States are examined via official crime statistics including the Uniform Crime Reports, victimization surveys, and self-report studies. Alternative measures including indices of seriousness of various offenses are reviewed. Attention is also devoted to historical studies of the nature and extent of criminal behavior. Finally, problems and prospects regarding accurate measures of crime and crime correlates are discussed.

CJ 3510 Computer Applications in Criminal Justice

An introduction to the computer and its applicability to criminal justice, research, and operations. Topics

covered include command language, file creation and editing, data storage modes, introductory FORTRAN, simulation, graphics, and word processing. Course requirements include a series of computer assignments concerning criminal data and problems.

CJ 3511 Theories of Delinquency

Examines critically the major theoretical explanations of juvenile delinquency. Theoretical approaches include social disorganization, subcultural theory, strain, control theory, labeling and conflict theory. In addition, current data on the nature and distribution of delinquency are discussed, and findings from empirical research are highlighted.

CJ 3512 Penology and Corrections

This course is designed to familiarize graduate students with the major problems and issues in the American "correctional" system today. We will cover theories of punishment; types of punishment; the history of and conditions in institutions for juveniles, men, and women; and the crisis in overcrowding brought on by recent sentencing "reforms"—among other topics.

CJ 3513 Victimology

Critically examines theories and research regarding victims of crime. Special attention is devoted to an analysis of National Crime Survey victimization data. Also concepts such as fear of crime, victim vulnerability, and victim culpability are discussed. In addition, implications of victim-oriented research for the administration of justice are assessed, as are current programs offering victim services such as restitution and compensation. Future trends in theory, research, and public policy are analyzed.

CJ 3514 Police Functions in Democratic Society

An examination of the sociopolitical context within which American police departments developed in the nineteenth century as well as the changing forces that shape modern departments. Considers the implications of democratic institutions and traditions for policing in America. The organization of several different kinds of departments are contrasted, and the implications of these different types of departments for police performance are examined. The rigors of police work, together with the social-psychological adjustments that officers at different ranks make, is also considered.

CJ 3515 Women and the Criminal Justice System

An examination of the roles of women in the criminal justice system. The course focuses on women as offenders, as victims, and as agents of social control; on both theory and practice, and on both historical and contemporary issues.

CJ 3516 Court Management and Administration

The organization and structure of the courts, including the problems, policies, and practices of the criminal court system. Particular emphasis is placed on the lower criminal court. Issues in court management, including personnel problems, scheduling, role

of juries and witnesses, use of planning and management techniques, and court reform, are reviewed.

CJ 3517 Terrorism

Divided into two sections, the first part of which examines the sociology of terrorism, including funding, intelligence gathering, weapons and tactics, informers, and countermeasures. Special attention is also given to the media which report the news, yet seem often perilously close to inciting further terror. The "terrorist personality," the literary depiction of terrorism, and the doctrine of systematic terrorism, as well as its current interpretations and common patterns, motives, and aims, are also examined.

The second part concentrates on identifying technologies of counterterrorism, discussing incident management needs, and recommending ways to lessen the risk of nationally disruptive acts. The course attempts to challenge accepted assumptions and to forecast changes in terrorist activities that may affect tomorrow's headlines.

CJ 3518 Issues in Juvenile Justice

A critical analysis of the policies and practices of agencies involved in processing young people through the juvenile justice system. Specific attention is devoted to police practices, detention, intake, diversion, adjudication, and disposition of juveniles within the justice system. In addition, the course focuses on the historical development of the juvenile justice system and assesses current trends and proposals for reform.

CJ 3519 Organized Crime

The course approaches organized crime from a law enforcement perspective, stressing, however, the general criminal justice implications. The corruptive influences of organized crime are dealt with, as well as aspects of overzealous enforcement that may lead to violations of constitutional safeguards. The scope of intelligence activities and the role of computerized information concerning organized crime are explored with special attention given to sensitive privacy issues involved. Problems of definition, organizational structure, operating methods, participant identification, and legal limitations are discussed. The effect of so called "victimless crime" status in enhancing the economic viability and public tolerance of organized crime is also considered, and present strategies suggested for the control or elimination of this pervasive phenomenon. Finally, the relationship of organized crime to the continuing increase of both "street" and "white collar" crime is assessed.

CJ 3520 Conflict Management

An examination of problems in conflict management, including concepts and definitions of social conflict and comparisons between functional and dysfunctional conflict. Inquiries into representative conflict management strategies and techniques are made, affording the opportunity to relate general theory and research results to practical situations of criminal conflict management. The course generally relies

on a variety of heuristic techniques, including scenarios, role playing, and the use of audiovisual media.

CJ 3521 Probation and Parole

An examination of the nature, objectives, means, and problems of probation and parole administration and management.

CJ 3523 Law Enforcement and the Community

This course examines the nature, problems, and present procedures associated with police-community relations in order to develop more efficient and effective policing. The course utilizes the lecture-forum technique with assigned readings, group discussions, and project development and critiquing.

CJ 3524 Theories of Punishment

An overview of theories and issues in punishment with a focus on topics of contemporary interest as well as the historical roots of current approaches. Trends and fashions in both the theory and the form of punishment are considered. Reading materials are drawn from a variety of fields, including philosophy, politics, literature, law, and empirical criminal justice.

CJ 3525 Correctional Administration

An intensive coverage of the many problems and dilemmas which confront the correctional organization. Topics for discussion include such issues as basic problems of correctional organization, organizational development and analysis, management by objectives, planning and budgeting systems, management style and personnel development, special problems of jails and houses of corrections, institutional programs, classifications, correctional policy, and the future of imprisonment.

CJ 3527 Community Corrections

This course examines the concepts of community corrections, utilizing historical, philosophical, and pragmatic perspectives and including an analysis of the alternatives to imprisonment or institutionalization. For course purposes, community-based programs are defined as programs aimed at reducing the occurrence of criminal and delinquent behavior through prevention, rehabilitation, reintegration, and/or diversionary services in noninstitutional settings which make maximum use of existing and potential community resources.

CJ 3529 Comparative Criminology

Crime and its control from the comparative perspective, viewed both historically and contemporaneously. The development of Roman legal institutions, the emergence of common law and other legal systems (the civil law and the socialist legal system), and the emergence of American legal institutions in the nineteenth century are all examined. The crime problems in developing societies (India, nineteenth-century Europe and America) are contrasted with those in developed societies (modern Europe and America), and the impact of a world economic system on the two is explored. The advantages of comparative analysis are developed.

CJ 3531 White Collar Crime

This course is designed to examine critically the current theoretical, research, and public policy issues regarding white collar crime. The first part examines definitions of white collar crime as well as various typologies of white collar crime activity. The nature, extent and consequences of white collar crime in the United States will also be assessed. Finally, explanations for the commission of these offenses will be discussed. The second part uses case studies to explore in more detail white collar crime. For example, cases of employee theft, corporate crime, governmental deviance, industrial espionage, and computer crime will be presented and discussed. The third part focuses on controlling white collar crime. The problems of traditional criminal justice systems in controlling white collar crime will be examined and the prospects of alternative systems of control—civic law, private security, public opinion—will be assessed.

CJ 3801, CJ 3802 Directed Study I and II

An independent study offers the student the opportunity to bring individual, concentrated attention to a particular topic as arranged and agreed upon in advance by a faculty member and the student. This option is generally recommended when the student desires a more intensive analysis of a particular subject. The independent study has the advantage of allowing students flexibility in learning and developing their own academic programs.

CJ 3803, CJ 3804 Internship I and II

Field instruction in a criminal justice agency where instruction may be offered through administrative, research, teaching and/or related activities. Students have the opportunity to apply theoretical concepts in a practical, applied fashion by observing and contributing to the daily activities of operating agencies and organizations.

CJ 3805 Master's Thesis

Students electing to write a Master's thesis must select a thesis topic with the advice of a faculty member and receive approval of the thesis topic from the graduate director.

CJ 3806 Field Practicum Seminar

This course is designed to provide a setting in which field practicum experiences can be discussed and analyzed as they relate to planning and management principles. By virtue of the field placement, the student will be exposed to the routine activities of a public agency/organization. The seminar will be the forum to integrate the practical experience with the theoretical concepts they have been exposed to.

Engineering

Graduate School of Engineering

Chemical Engineering

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time.

CHE 3300 Chemical Engineering Mathematics (formerly 04.802) 4 Q.H. **Fall Quarter, Alternating Years**

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables. Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses. *Prereq.: BS degree in Chemical Engineering including mathematical analysis.*

CHE 3301 Chemical Engineering Mathematics 2 Q.H. **Fall Quarter, As Announced**

CHE 3301 and CHE 3302 cover the same material with the same prerequisites as CHE 3300, but in two 2 Q.H. courses.

CHE 3302 Chemical Engineering Mathematics II 2 Q.H. **Winter Quarter** Continuation of CHE 3301. *Prereq.: CHE 3301.*

CHE 3310 Chemical Engineering Thermodynamics I (formerly 04.811) 4 Q.H. **Winter Quarter, Alternating Years**

Classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. A study of phase equilibria involving the various states of matter; prediction and correlation of physical, chemical, and transport properties of gases and liquids; elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Fundamental principles are reviewed to the extent needed. *Prereq.: BS degree in Chemical Engineering.*

CHE 3311 Chemical Engineering Thermodynamics I 2 Q.H. **Winter Quarter, As Announced** CHE 3311 and CHE 3312 cover the same material with the same prerequisites as CHE 3310, but in two 2 Q.H. courses.

CHE 3312 Chemical Engineering Thermodynamics II 2 Q.H. **Spring Quarter, As Announced** Continuation of CHE 3311. *Prereq.: CHE 3311.*

CHE 3320 Separation Process (formerly 04.978) 4 Q.H. **Spring Quarter, Alternating Years**

Calculation and design methods used in processes involving mass transfer. Topics covered include vapor liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption and extraction. Emphasis is placed on methods and techniques which are common to many separation processes. *Prereq.: BS degree in Chemical Engineering.*

CHE 3321 Separation Processes I 2 Q.H. **Winter Quarter, As Announced**

CHE 3321 and CHE 3322 cover the same material with the same prerequisites as CHE 3320, but in two 2 Q.H. courses.

CHE 3322 Separation Processes II 2 Q.H. **Spring Quarter, As Announced** Continuation of CHE 3321. *Prereq.: CHE 3321.*

CHE 3330 Chemical Process Control (formerly 04.829) 4 Q.H. **Fall Quarter, Alternating Years**

Review of classical control techniques; state variable representation and analysis of continuous control systems in chemical engineering, including controllability, observability, and stability. Multivariable control problems in chemical engineering; introduction to optimal control. Digital simulation included where appropriate. *Prereq.: Graduate standing in Chemical Engineering or permission.*

CHE 3331 Chemical Process Control I 2 Q.H. **Fall Quarter, As Announced**

CHE 3331 and CHE 3332 cover the same material with the same prerequisites as CHE 3330, but in two 2 Q.H. courses.

CHE 3332 Chemical Process Control II 2 Q.H. **Winter Quarter** Continuation of CHE 3331. *Prereq.: CHE 3331.*

CHE 3340 Heterogeneous Catalysis (formerly 04.890) 4 Q.H. **Winter Quarter, Alternating Years**

Experimental methods required for determining the surface area and pore structure of catalyst carriers are discussed. These structural characteristics are utilized to estimate mass and heat transport rates within porous catalyst in order to determine their effectiveness with respect to chemical reaction. Mechanisms for chemical poisoning of catalysts are

also analyzed. Reactions of practical interest are used to illustrate the applications of heterogeneous catalysis to modern chemical processing problems. *Prereq.: BS degree in Chemical Engineering.*

CHE 3341 Heterogeneous Catalysis I 2 Q.H.
Winter Quarter, As Announced

CHE 3341 and CHE 3342 cover the same material with the same prerequisites as CHE 3340, but in two 2 Q.H. courses.

CHE 3342 Heterogeneous Catalysis II 2 Q.H.
Spring Quarter, As Announced

Continuation of CHE 3341. *Prereq.: CHE 3341.*

CHE 3350 Chemical Process Heat Transfer 4 Q.H.
(formerly 04.973)

Spring Quarter, Alternating Years

Empirical methods and calculations used to design heat transfer equipment for the chemical process industries. Review of basic heat transfer principles. Shell-and-tube calculations for liquid and/or vapor phase heat transfer. Direct contact and other special heat exchanger applications. *Prereq.: BS degree in Chemical Engineering.*

CHE 3351 Chemical Process Heat Transfer I 2 Q.H.
Winter Quarter, As Announced

CHE 3351 and CHE 3352 cover the same material with the same prerequisites as CHE 3350, but in two 2 Q.H. courses.

CHE 3352 Chemical Process Heat Transfer II 2 Q.H.
Spring Quarter, As Announced

Continuation of CHE 3351. *Prereq.: CHE 3351.*

CHE 3400 Advance Chemical Engineering Calculations (formerly 04.801) 4 Q.H.
As Announced

Fundamental process principles leading to an understanding of the stoichiometric principles of chemical process plants. The study of complex material and energy balances is undertaken with the view to apply these principles to actual large chemical plant conditions. *Prereq.: BS degree in Chemical Engineering including differential equations.*

CHE 3401 Advanced Chemical Engineering Calculations I 2 Q.H.
As Announced

CHE 3401 and CHE 3402 cover the same material with the same prerequisites as CHE 3400, but in two 2 Q.H. courses.

CHE 3402 Advanced Chemical Engineering Calculations II 2 Q.H.
As Announced

Continuation of CHE 3401. *Prereq.: CHE 3401.*

CHE 3410 Numerical Techniques in Chemical Engineering (formerly 04.803) 4 Q.H.
Fall Quarter, As Announced

Digital computer applications to chemical engineering problems. Topics covered include location of

roots of linear and nonlinear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and to the subject of linear algebra. *Prereq.: BS degree in Chemical Engineering.*

CHE 3411 Numerical Techniques in Chemical Engineering I 2 Q.H.
Fall Quarter, As Announced

CHE 3411 and CHE 3412 cover the same material with the same prerequisites as CHE 3410, but in two 2 Q.H. courses.

CHE 3412 Numerical Techniques in Chemical Engineering II 2 Q.H.
Winter Quarter, As Announced

Continuation of CHE 3411. *Prereq.: CHE 3411.*

CHE 3430 Chemical Data Estimation 2 Q.H.
(formerly 04.832)

As Announced

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Latest empirical relationships and physical and thermodynamics laws are introduced to obtain data for plant design and other chemical and engineering uses. *Prereq.: BS degree.*

CHE 3450 Analytical and Numerical Techniques (formerly 04.835) 4 Q.H.
As Announced

For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. *Prereq.: BS degree and knowledge of digital computer programming.*

CHE 3500 Transport Phenomena 4 Q.H.
(formerly 04.823)

Winter Quarter, As Announced

Momentum rate conservation equations for steady-state fluid flow in two-dimensional boundary layers are presented and solved to obtain the fluid velocity profiles. These results are utilized in the consideration of heat and mass transfer phenomena at a fluid-solid interface. The development of surface renewal theory is presented and applied to the description of heat and mass transfer phenomena. *Prereq.: BS degree in Chemical Engineering.*

CHE 3501 Transport Phenomena I 2 Q.H.
Winter Quarter, As Announced

CHE 3501 and CHE 3502 cover the same material with the same prerequisites as CHE 3500, but in two 2 Q.H. courses.

CHE 3502 Transport Phenomena II 2 Q.H.
Spring Quarter, As Announced

Continuation of CHE 3501. *Prereq.: CHE 3501.*

CHE 3510 Modeling and Simulation of Chemical Process (formerly 04.837) **4 Q.H.****Winter Quarter, Alternating Years**

Use of special purpose and general purpose computer programs in solving the steady-state material and energy balances of chemical processes. Course includes related background material which may be applied to these computer programs such as convergence acceleration for calculations involving recycle streams, tearing recycle streams for iteration on minimum number of streams and minimum number of parameters, and algorithms for design variable selection. *Prereq.: Graduate standing in Chemical Engineering.*

CHE 3511 Modeling and Simulation of Chemical Process I **2 Q.H.****Winter Quarter, As Announced**

CHE 3511 and CHE 3512 cover the same material with the same prerequisites as CHE 3510, but in two 2 Q.H. courses.

CHE 3512 Modeling and Simulation of Chemical Process II **2 Q.H.****Spring Quarter, As Announced**

Continuation of CHE 3511. *Prereq.: CHE 3511.*

CHE 3520 Computer Process Control (formerly 04.830) **4 Q.H.****Winter Quarter, Alternating Years**

Computer control hardware and software. Z-transform, pulse transfer functions, and data holds. Open and closed-loop response and design of sampled-data systems. Computer control algorithms. Digital simulation of sampled data-systems. *Prereq.: Graduate standing in Chemical Engineering or permission.*

CHE 3521 Computer Process Control I **2 Q.H.****Winter Quarter, As Announced**

CHE 3521 and CHE 3522 cover the same material with the same prerequisites as CHE 3520, but in two 2 Q.H. courses.

CHE 3522 Computer Process Control II **2 Q.H.****Spring Quarter, As Announced**

Continuation of CHE 3521. *Prereq.: CHE 3521.*

CHE 3530 Advanced Management Techniques in the Chemical Industry (formerly 04.840) **4 Q.H.****Fall Quarter, Alternating Years**

Management techniques applied to the chemical industry. Special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. *Prereq.: Graduate standing.*

CHE 3531 Advanced Management Techniques in the Chemical Industry I **2 Q.H.****Fall Quarter, As Announced**

CHE 3531 and CHE 3532 cover the same material with the same prerequisites as CHE 3530, but in two 2 Q.H. courses.

CHE 3532 Advanced Management Techniques in the Chemical Industry II **2 Q.H.****Winter Quarter, As Announced**

Continuation of CHE 3531. *Prereq.: CHE 3531.*

CHE 3540 Advanced Process Design Concepts (formerly 04.845) **4 Q.H.****Spring Quarter, Alternating Years**

This course stresses techniques and approaches used in the development of new or improved processes. Topics include establishment of process bases, use of process simulators in design, optimization and evaluation of alternatives, and preliminary equipment design and cost estimating techniques. *Prereq.: BS degree in Chemical Engineering.*

CHE 3541 Advanced Process Design Concepts I **2 Q.H.****Fall Quarter, As Announced**

CHE 3541 and CHE 3542 cover the same material with the same prerequisites as CHE 3540, but in two 2 Q.H. courses.

CHE 3542 Advanced Process Design Concepts II **2 Q.H.****Winter Quarter, As Announced**

Continuation of CHE 3541. *Prereq.: CHE 3541.*

CHE 3543 Advanced Plant Design Concepts II **2 Q.H.****Spring Quarter, As Announced**

Modern approaches to plant design: computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. *Prereq.: BS degree in Chemical Engineering.*

CHE 3560 Fluid Mechanics (formerly 04.974) **4 Q.H.****Fall Quarter, Alternating Years**

Discussion of statics, kinematics, and stress concepts associated with fluids. Formation of the general equations of motion with application to laminar and turbulent flow. Topics on boundary layer theory and compressible flow are included. *Prereq.: BS degree in Chemical Engineering.*

CHE 3561 Fluid Mechanics I **2 Q.H.****Fall Quarter, As Announced**

CHE 3561 and CHE 3562 cover the same material with the same prerequisites as CHE 3560, but in two 2 Q.H. courses.

CHE 3562 Fluid Mechanics II **2 Q.H.****Winter Quarter, As Announced**

Continuation of CHE 3561. *Prereq.: CHE 3561.*

CHE 3600 Polymer Science (formerly 04.870) **4 Q.H.****Fall Quarter, Alternating Years**

Basic concepts of polymers, thermodynamics of polymer solutions and measurement of molecular weight. Physical and chemical testing of polymers. Crystallinity in polymers and rheology of polymers. Physical and chemical properties of polymers.

Mechanisms and conditions for polymerization of polymers including step-reaction, addition and copolymerization. Discussion of carbon-chain polymers, fibers and fiber technology. *Prereq.: BS degree in Chemical Engineering or Chemistry.*

CHE 3601 Polymer Science I 2 Q.H.
Fall Quarter, As Announced

CHE 3601 and CHE 3602 cover the same material with the same prerequisites as CHE 3600, but in two 2 Q.H. courses.

CHE 3602 Polymer Science II 2 Q.H.
Winter Quarter

Continuation of CHE 3601. *Prereq.: CHE 3601.*

CHE 3620 Principles of Polymerization 4 Q.H.
(formerly 04.872)

Fall Quarter, Alternating Years

Introduction to polymers and polymer properties. Mechanisms of polymerization including step polymerization, radical-chain polymerization, emulsion polymerization, ionic-chain polymerization, chain copolymerization and ring-opening polymerization. Stereo chemistry of polymerization and synthetic reactions of polymers. Applications to reactor design of industrially important polymers. *Prereq.: Graduate standing in Chemical Engineering.*

CHE 3621 Principles of Polymerization I 2 Q.H.
Fall Quarter

CHE 3621 and CHE 3622 cover the same material with the same prerequisites as CHE 3620, but in two 2 Q.H. courses.

CHE 3622 Principles of Polymerizations II 2 Q.H.
Winter Quarter, As Announced

Continuation of CHE 3621. *Prereq.: CHE 3621.*

CHE 3630 Chemical Process Pollution 4 Q.H.
Control (formerly 04.850)

Spring Quarter, Alternating Years

Provides chemical engineering students with basic fundamentals for handling environmental problems in the chemical process industries. Water quality requirements and industrial waste characteristics; wastewater treatment processes applicable to environmental engineering; biological treatment processes and equipment; comprehensive design problems involving biological and tertiary treatment; the economics of water treatment and reuse. *Prereq.: Graduate standing in Chemical Engineering.*

CHE 3631 Chemical Process Pollution 2 Q.H.
Control I

Winter Quarter

CHE 3631 and CHE 3632 cover the same material with the same prerequisites as CHE 3630, but in two 2 Q.H. courses.

CHE 3632 Chemical Process Pollution 2 Q.H.
Control II

Spring Quarter

Continuation of CHE 3631. *Prereq.: CHE 3631.*

CHE 3660 Solar Energy Thermal 2 Q.H.
Processes (formerly 04.862)

Fall Quarter

Covers fundamental thermal processes involved in obtaining useful heat from flat-plate solar collectors. The components required in an active solar energy collection system are analyzed, and the economics of the system are considered. *Prereq.: BS degree.*

CHE 3663 Fundamentals of Polymer 4 Q.H.
Processing (formerly 04.871)

Winter Quarter, Alternating Years

Transport properties of polymer solutions and polymer melts. Modeling and design of polymer processing equipment. Flow models for processes involving heat, mass, and/or momentum transfer. Analysis of flow stability and elastic phenomena. Applications to the design of equipment for extrusion, calendering, coating, fiber spinning, tubular film blowing, injection molding and mixing. *Prereq.: Graduate standing in Chemical Engineering.*

CHE 3664 Fundamentals of Polymer 2 Q.H.
Processing I

Winter Quarter

CHE 3664 and CHE 3665 cover the same material with the same prerequisites as CHE 3663, but in two 2 Q.H. courses.

CHE 3665 Fundamentals of Polymer 2 Q.H.
Processing II

Spring Quarter

Continuation of CHE 3664. *Prereq.: CHE 3664.*

CHE 3670 Special Topics in Chemical 4 Q.H.
Engineering (formerly 04.899)

As Announced

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. *Prereq.: Permission of department staff.*

CHE 3671 Kinetics of Chemical Processes 2 Q.H.
(formerly 04.891)

Spring Quarter, Alternating Years

The theoretical foundations for the analysis of elementary chemical reaction rates, such as collision theory, particle dynamics, and transition state theory are presented. Consideration is given to the theory of monomolecular reactions and the effect of solvent and electrostatic forces on liquid phase reaction rates. Homogeneous catalysis and selected free-energy correlations are covered. *Prereq.: BS degree in Chemical Engineering.*

CHE 3672 Kinetics of Chemical 2 Q.H.
Processes I

Winter Quarter

CHE 3672 and CHE 3673 cover the same material with the same prerequisites as CHE 3671, but in two 2 Q.H. courses.

CHE 3673 Kinetics of Chemical Processes II Spring Quarter, As Announced Continuation of CHE 3672. <i>Prereq.: CHE 3672.</i>	2 Q.H.	CHE 3798 Masters Thesis Continuation (formerly 04.9X1) Any Quarter	0 Q.H.
CHE 3680 Corrosion Fundamentals (formerly 04.821) As Announced Economic factors, basic theories, types, behaviors of specific systems, and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized. <i>Prereq.: BS degree.</i>	2 Q.H.	CHE 3799 PhD Continuation (formerly 04.9X4) Any Quarter	0 Q.H.
CHE 3690 Seminar (formerly 04.990) Any Quarter Topics of an advanced nature are presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. <i>Prereq.: Graduate standing in Chemical Engineering.</i>	2 Q.H.	CHE 3860 Thesis (Master's Degree) (formerly 04.991) Any Quarter Analytical and/or experimental work conducted under the supervision of the department. 10 Q.H. maximum credit for thesis. Students normally register in CHE 3861 or CHE 3862. <i>Prep.: Graduate Standing in Chemical Engineering.</i>	10 Q.H.
CHE 3701 Special Topics in Chemical Engineering I Any Quarter Topics of interest to the staff members are presented for advanced study. A student may take this course and its continuation in CHE 3702 with the same instructor.	2 Q.H.	CHE 3861 Thesis (Master's Degree) Any Quarter	4 Q.H.
CHE 3702 Special Topics in Chemical Engineering II Any Quarter A continuation of CHE 3701.	2 Q.H.	CHE 3862 Thesis (Master's Degree) Any Quarter	2 Q.H.
CHE 3796 DEng Continuation Any Quarter	0 Q.H.	CHE 3880 Thesis (PhD Degree) (formerly 04.995) Any Quarter Theoretical and experimental work conducted under the supervision of the department. <i>Prereq.: Admission to doctoral program in Chemical Engineering.</i>	0 Q.H.
		CHE 3885 Thesis (DEng Degree) (formerly 04.996) Any Quarter Theoretical and experimental work conducted under the supervision of the department. <i>Prereq.: Admission to program in Chemical Engineering.</i>	0 Q.H.

Civil Engineering

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time.

CIV 3131 Engineering Statistics I (formerly 01.916) Fall Quarter The basic elements of probability theory and statistics and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, transportation. Probability of events, random variables and distributions, derived distributions, expectation, common probability models. <i>Prereq.: Undergraduate calculus.</i>	2 Q.H.	CIV 3134 Decision Analysis in Civil Engineering Spring Quarter Basic theory of decision-making under uncertainty, applied to design and managerial problems in civil engineering, feasibility analysis and construction (e.g. reservoir capacity design, dam safety options, to build or not to build a drainage system, flood levee design, economic analysis of construction projects, value engineering, construction method selection in tunneling). Decision trees, value of perfect information and value of sample information. Multi-criteria decision making and multi-attribute utility theory. <i>Prep. CIV 3131.</i>	2 Q.H.
CIV 3132 Engineering Statistics II (formerly 01.917) Winter Quarter Continuation of CIV 3131. Includes parameter estimation, confidence intervals, hypothesis testing, and linear statistical models. <i>Prereq.: CIV 3131.</i>	2 Q.H.		

CIV 3136 Performance and Safety Evaluation 2 Q.H.
in Civil Engineering
Spring Quarter

Application of reliability to the design and analysis of civil engineering facilities. The reliability of redundant systems such as indeterminate structure. Statistical distributions of system parameters (e.g. component strengths, flow rates, soil strengths) and demands (e.g. seismic loading, traffic volumes). Safety indices, load factors, and reliability based design codes. Damage evaluation and reliability prediction of civil engineering facilities. *Prep. CIV 3131.*

CIV 3141 Numerical Methods in Civil Engineering I (formerly 01.888) 2 Q.H.

Fall Quarter, Alternate Years

Introduction, errors in numerical analysis. Solution of nonlinear algebraic equations by direct and iterative methods. Introduction to matrix eigenvalue problems. Examples are drawn from structural mechanics. *Prereq.: Admission to the Graduate School of Engineering.*

CIV 3142 Numerical Methods in Civil Engineering II (formerly 01.889) 2 Q.H.

Winter Quarter, Alternate Years

Continuation of CIV 3141. Approximation of functions: interpolation, and least squares curve fitting; orthogonal polynomials. Numerical differentiation and integration. Solution of ordinary and partial differential equations, and integral equations; discrete methods of solution of initial and boundary-value problems. Examples are drawn from structural mechanics, geotechnical engineering, hydrology and hydraulics. *Prereq.: CIV 3141.*

CIV 3161 Systems Analysis I (formerly 01.807) 2 Q.H.

Fall Quarter

Application of linear optimization models to various civil engineering problems: the simplex method, sensitivity analysis, transportation problem, transshipment problem, shortest path problem. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3162 Systems Analysis II (formerly 01.808) 2 Q.H.

Winter Quarter

Further application of systems analysis techniques to civil engineering problems: dynamic programming, linear regression, model estimation, queuing theory, project evaluation. *Prereq.: CIV 3161 and CIV 3131; to be taken concurrently with CIV 3132.*

CIV 3163 Systems Analysis III (formerly 01.809) 2 Q.H.

Spring Quarter

Further application of techniques and approaches presented in CIV 3161 and CIV 3162. New topics to be presented include integer programming, nonlinear programming, simulation, decision analysis. Other topics may be added according to interest, as time allows. Aim will be to help prepare students to com-

plete a term project employing numerous techniques of systems analysis. *Prereq.: CIV 3162.*

CIV 3171 Seminar in Public Works I 2 Q.H.
Winter Quarter

History and role of Public Works in development (topics include historical development, economic and financial dimensions of public works in city and state government, technological change, local, regional and national planning); Public Works capital development (topics include political, economic, financial, social, administrative and technical factors). *Prep. Admission to Graduate School of Engineering.*

CIV 3172 Seminar in Public Works II 2 Q.H.
Spring Quarter

Public Works applications in management science (topics include applications of benefit/cost, cost-effectiveness, allocation, models, decision theory, queuing theory, simulation, etc.); Maintenance management (topics include inventory, performance standards, scheduling, budgets and finance); Public Works planning issues (topics include environmental assessment, techniques of land use planning and procedures, facility location and resource utilization. *Prep. CIV 3171.*

CIV 3231 Construction Management I 2 Q.H.
(formerly 01.821)

Fall Quarter

This course treats cost estimating, including a description of computerized cost estimating systems; duration estimating, considering work analysis techniques; value engineering as a concept and its effect on the construction industry; and specifications, including the use and importance of computerized Specification Writing Systems. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3232 Construction Management II 2 Q.H.
(formerly 01.822)

Winter Quarter

This course contains treatment of the application of scheduling methods to the control of construction activities including resource allocation, quality control, cash flow progress reporting, and the effects of change orders. *Prereq.: CIV 3231.*

CIV 3237 Construction Methods and Equipment I (formerly 01.830) 2 Q.H.

Fall Quarter

This course treats typical approaches to construction in a selection of application areas such as steel and concrete structures, hydraulic and port facilities, horizontal construction and the like. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3238 Construction Methods and Equipment II (formerly 01.831) 2 Q.H.

Winter Quarter

This course is a continuation of CIV 3237, treating additional areas of construction. *Prereq.: CIV 3237.*

CIV 3241 Legal Aspects of Civil Engineering (formerly 01.832) **2 Q.H.****Fall Quarter**

A presentation of United States and international legal systems and theories necessary for the comprehension of business and contractual liabilities, rights and obligations in the engineering field. *Prereq.: Admission to the Graduate School of Engineering.*

CIV 3242 Legal Aspects of Civil Engineering II (formerly 01.833) **2 Q.H.****Winter Quarter**

This course deals with the description and evaluation of various types of construction contracts, procedures and formats for submitting bids, filing claims, and legal steps to avoid liabilities, utilizing the principles learned in CIV 3241. *Prereq.: CIV 3241.*

CIV 3245 Construction Seminar (formerly 01.827) **2 Q.H.****Spring Quarter**

This course is a reading and discussion course centering on recent research publications in Construction Engineering. *Prereq.: Limited to Construction Management Program majors; to be taken in final spring quarter.*

CIV 3250 Project Evaluation and Financing **2 Q.H.****Fall Quarter**

Review of project evaluation techniques, as applied to construction and infrastructure projects. Bond pricing mortgage analysis. Construction loan analysis in the development process. Valuation of income-producing properties. Project financing packages in the areas of real property and infrastructure. Impact of financing on project value. Capital Budgeting Models and their applications to infrastructure planning. *Prep. Concurrent with ACC 3811.*

CIV 3252 Construction Project Control and Organization **2 Q.H.****Winter Quarter**

Organization of construction firms, both at the general corporate level and at the project level. Organization dynamics designed to respond to the requirements of the environment given the internal constraints of the firm. Computer systems for the control of construction projects. Design attributes to fit the needs of the organization and the end users. Estimating, scheduling, budgeting and financial control of projects. Network-based systems for planning and time control. Intra-project and inter-project resource allocation. Data-base design concepts for decision support systems. *Prep. CIV 3161.*

CIV 3310 Environmental Chemistry I (formerly 01.920) **2 Q.H.****Fall Quarter**

A review of basic chemistry is followed by a discussion of the equilibrium chemistry of homogeneous and heterogeneous systems with applications in environmental engineering. The physical and chemical properties of water are studied, as are acidity, alkalinity, hardness, and water softening. Topics in

receiving water quality and disinfection are included.

Prereq.: Two quarters of general chemistry.

CIV 3311 Environmental Chemistry II (formerly 01.921) **2 Q.H.****Winter Quarter**

Continuation of CIV 3310, including the basic principles of chemical thermodynamics, electrochemistry, kinetics, organic chemistry, biochemistry, and nuclear chemistry as they relate to environmental engineering. Colloidal chemistry and coagulation are discussed as are fundamental water quality parameters such as BOD, COD, and TOC. *Prereq.: CIV 3310; to be taken concurrently with CIV 3325.*

CIV 3312 Environmental Chemistry I and II (formerly 01.923) **4 Q.H.****Fall Quarter**

This course embodies the material in CIV 3310 and CIV 3311. *Prereq.: Two quarters of general chemistry.*

CIV 3315 Water and Wastewater Treatment I (formerly 01.910) **2 Q.H.****Fall Quarter**

Water quality, water impurities and effects, the theory and practice of water treatment, and the elements of design of water treatment works including intake facilities, wells, coagulation, sedimentation, filtration, softening, iron and manganese removal, disinfection and fluoridation. *Prereq.: Undergraduate fluid mechanics and CIV 3311.*

CIV 3316 Water and Wastewater Treatment II (formerly 01.911) **2 Q.H.****Winter Quarter**

Waste characteristics, the theory and practice of wastewater treatment and disposal, and the elements of design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological treatment processes, sludge digestion and disposal, stabilization ponds, and disinfection. *Prereq.: CIV 3315.*

CIV 3317 Water and Wastewater Treatment III (formerly 01.912) **2 Q.H.****Winter and Spring Quarters**

Desalination, advanced wastewater treatment, land treatment, effluent disposal and reuse, small alternative wastewater systems, and other special problems in water and wastewater characteristics and treatment, including corrosion control, and application and storage of chemicals. *Prereq.: CIV 3316 or CIV 3318.*

CIV 3318 Water and Wastewater Treatment I and II (formerly 01.914) **4 Q.H.****Fall Quarter**

This course embodies the material in CIV 3315 and CIV 3316. *Prereq.: Undergraduate fluid mechanics; to be taken concurrently with CIV 3312.*

CIV 3320 Environmental Microbiology (formerly 01.922) **2 Q.H.****Winter and Spring Quarters**

A study of microbiology with emphasis on environmental engineering applications. The course includes

cell structure, nutrition, morphology, growth, reproduction, and metabolism of microorganisms of environmental significance. Effects of environmental factors including inhibition, killing, and natural habitats are discussed. In addition, anaerobic digestion and eutrophication are covered. *Prereq.: CIV 3311; to be taken concurrently with CIV 3326.*

CIV 3325 Environmental Analysis I 2 Q.H.
(formerly 01.930)
Winter Quarter

A laboratory course for the analytical evaluation of environmental conditions. Included are coagulation studies, chlorine demand determination, and the use of colorimetric spectroscopy. Interpretation of analytical results for practical applications is also stressed. *Prereq.: CIV 3310; to be taken concurrently with CIV 3311.*

CIV 3326 Environmental Analysis II 2 Q.H.
(formerly 01.931)
Spring Quarter

Laboratory analyses are continued with emphasis on the chemical and biological analyses associated with wastewater treatment methods. Nitrogen determinations are included. Gas chromatography and atomic absorption spectroscopy are used for trace analyses of organics and metals. *Prereq.: CIV 3325; to be taken concurrently with CIV 3320.*

CIV 3327 Environmental Analysis I and II 4 Q.H.
(formerly 01.933)
Fall Quarter

This course embodies the material in CIV 3325 and CIV 3326. *Prereq.: to be taken concurrently with CIV 3312.*

CIV 3341 Industrial Waste Disposal 2 Q.H.
(formerly 01.913)
Spring Quarter

Evaluation of industrial waste problems and development of process design for the required treatment facilities; study of various manufacturing processes and their wastewater problems; industrial waste survey techniques; characteristics of industrial wastes; evaluation of hazardous materials; waste reduction methods; physical, chemical, biological and advanced treatment methods; industrial wastewaters and disposal and treatment of industrial solids and liquids. *Prereq.: CIV 3311 and CIV 3317.*

CIV 3343 Unit Operations in 2 Q.H.
Environmental Engineering I (formerly 01.935)
Winter Quarter

Laboratory scale unit operations illustrating the physical, chemical and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. *Prereq.: CIV 3317 and CIV 3326.*

CIV 3344 Unit Operations in 2 Q.H.
Environmental Engineering II (formerly 01.936)
Spring Quarter

Continuation of CIV 3343. Topics include biodegradability studies using activated sludge, fixed-film reactors, anaerobic digestion, vacuum filtration, and chemical-physical processes involved in wastewater treatment. A comprehensive evaluation of each unit process is required in a report from each student. *Prereq.: CIV 3343.*

CIV 3348 Stream Sanitation 2 Q.H.
(formerly 01.954)
Winter Quarter

Analysis of the fate and effects of discharge of conservative and nonconservative pollutants in surface receiving waters and groundwaters. Topics include BOD and oxygen relationships in streams, eutrophication and general water quality improvement techniques. *Prereq.: CIV 3310.*

CIV 3351 Open Channel Flow I 2 Q.H.
(formerly 01.902)
Fall Quarter

Open channel flow classification; energy and momentum principles; uniform flow calculations; design of channels for uniform flow; channel transitions; gradually varied flow; surface profile computations; spatially varied flow. *Prereq.: Undergraduate fluid mechanics and hydraulic engineering.*

CIV 3352 Open Channel Flow II 2 Q.H.
(formerly 01.903)
Winter Quarter

Rapidly varied flow, hydraulic jump and its applications; flow through nonprismatic channel sections; flow in channels of nonlinear alignment, wave action; unsteady flow, dynamic equations; wave propagation; flood routing in rivers. *Prereq.: CIV 3351.*

CIV 3355 Hydrology I 2 Q.H.
(formerly 01.908)

Winter Quarter, Alternate Years

Elements of the hydrologic cycle, precipitation, evaporation, streamflow, groundwater; water balance equation for watersheds; streamflow hydrographs, unit hydrographs, hydrographs of overland flow; relation between precipitation and runoff; hydrologic and hydraulic routings, linear reservoirs routing. *Prereq.: CIV 3131 and undergraduate fluid mechanics and hydraulic engineering.*

CIV 3356 Hydrology II 2 Q.H.
(formerly 01.909)

Spring Quarter, Alternate Years

Deterministic hydrologic models; probability in hydrology; stochastic hydrology, generation of data, Markov chain series; flood forecasting; applications of hydrology and design considerations. *Prereq.: CIV 3132 and CIV 3355.*

CIV 3358 Flow Through Porous Media 2 Q.H.
(formerly 01.924)**Fall Quarter, Alternate Years**

Groundwater uses; properties of porous media; infiltration, saturated and unsaturated zones, soil water interactions; types of aquifers; Darcy's law, Dupuit-Forchier's assumption, groundwater flow equations, steady and unsteady cases; steady state seepage problems, method of flow nets; dispersion of groundwater, quality and contamination of groundwater. *Prereq.: Undergraduate fluid mechanics and hydraulic engineering.*

CIV 3360 Groundwater and Seepage 2 Q.H.
(formerly 01.925)**Winter Quarter, Alternate Years**

Hydraulics of wells, steady and transient flow equations, pumping tests, multiple well systems, methods of images; superposition, leaky aquifers, salt-water intrusion, static equilibrium and hydrodynamic equilibrium, control of saline water intrusion; numerical and experimental methods, physical models, analog models, finite difference solution, introduction to the method of finite elements. *Prereq.: CIV 3358.*

CIV 3363 Hydraulic Structures I 2 Q.H.
(formerly 01.963)**Fall Quarter, Alternate Years**

Reservoirs, characteristics, capacity, sedimentation, waves and floods; forces on dams; types of dams; gravity dams; earth dams; arch dams; cofferdams; turbines. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3364 Hydraulic Structures II 2 Q.H.
(formerly 01.964)**Winter Quarter, Alternate Years**

Intake structures; outlet structures, spillways; tunnels; canals; offshore protection. *Prereq.: CIV 3363.*

CIV 3367 Water Resources Planning 2 Q.H.
(formerly 01.965)**Spring Quarter, Alternate Years**

The nature of water resources projects (sociopolitical, legal); water resources planning objectives (economic, cost, benefit); problems in water resources engineering (development, design, operational, recapitulation); introduction to linear and dynamic programming; simulation methods; case studies. *Prereq.: CIV 3141 and CIV 3355.*

CIV 3370 Air Pollution Engineering 2 Q.H.
(formerly 01.950)**Winter Quarter**

Theory and practice related to engineering management of air resources; applications of models for the atmospheric dispersion of pollutants; analysis of control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discussion of source control evaluation and air quality standards. Course CIV 3374 is recommended. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3372 Air Sampling and Analysis 2 Q.H.
(formerly 01.955)**Spring Quarter**

A laboratory course in air pollution measurements utilizing physical, chemical and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitative measurements of pollutants are performed utilizing microscopy, spectrophotometry, gas chromatography, and atomic absorption spectroscopy. *Prereq.: CIV 3370.*

CIV 3374 Air Pollution Science 2 Q.H.
(formerly 01.957)**Fall Quarter**

Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. Note: This course is open to non-engineering as well as to engineering graduate students. *Prereq.: Consent of the department and instructor.*

CIV 3376 Industrial Hygiene 2 Q.H.
(formerly 01.952)**Winter Quarter**

Characterization and control of industrial problems associated with noise, heat and ventilation. Physical and biological aspects of environmental stress are discussed. Emphasis is placed on the application of engineering principles to the design of control systems. Evaluation procedures for control effectiveness are reviewed. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3378 Environmental Planning and Management 2 Q.H.
(formerly 01.980)**Fall Quarter**

Planning and operation, and management of specific environmental systems, such as collection systems; solids separators, combined systems control, sewer flushing, deposition loadings with least-squared applications, and case studies in optimal design of treatment plants with variable input. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3380 Environmental Protection 2 Q.H.
(formerly 01.985)**Spring Quarter, Alternate Years**

Environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems and renewable resources; interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3384 Solid Waste Management 2 Q.H.
(formerly 01.945)**Fall Quarter**

Basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices and reclamation possibilities. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3386 Hazardous Waste Practices 2 Q.H.
(formerly 01.946)**Spring Quarter**

An investigation of hazardous waste management practices including: identification, storage, transport, treatment processes, incineration, recycling, reuse, chemical landfills and groundwater contamination. *Prereq.: CIV 3311 or CIV 3312.*

CIV 3388 Design of Environmental Systems I (formerly 01.971) 2 Q.H.**Winter Quarter**

Examination of analysis and design of environmental control systems using computer-based models as a tool. Development of components of a treatment system model applicable to simulate process using accepted mathematical relationships. Optimization of various combinations of systems on the basis of economics and/or performance. Development of sensitivity tests for fluctuation in such items as labor or power units costs. *Prereq.: CIV 3317 and general knowledge of a computer language (BASIC or FORTRAN).*

CIV 3389 Design of Environmental Systems II (formerly 01.972) 2 Q.H.**Spring Quarter**

Fundamental design concepts of complete systems for environmental control, including water treatment; wastewater disposal, air quality control, and solid waste disposal; evaluation of economic alternatives for environmental quality control; discussion of actual engineering reports and designs will include considerations of the logic and conclusions. *Prereq.: CIV 3388.*

CIV 3410 Soil Mechanics I 2 Q.H.
(formerly 01.871)**Fall Quarter**

Phase relationships and index properties, permeability, capillarity, effective stress concept, porous media flow, stress distribution, stress path concept, 1-D settlement analysis. *Prereq.: Undergraduate course in soil mechanics.*

CIV 3411 Soil Mechanics II 2 Q.H.
(formerly 01.872)**Winter Quarter**

Continuation of CIV 3410. Consolidation theory, 3-D settlement analysis, shear strength properties of soils, stress path analysis. *Prereq.: CIV 3410.*

CIV 3412 Soil Mechanics III 2 Q.H.
(formerly 01.873)**Spring Quarter**

Continuation of CIV 3411. Stability of open cuts and natural slopes; numerical analysis and computer

applications to stability, seepage, consolidation, and deformation problems, laboratory testing; field instrumentation; special topics. *Prereq.: CIV 3411 or CIV 3413.*

CIV 3413 Soil Mechanics I and II 4 Q.H.
(formerly 01.877)**Fall Quarter**

Embodies the material in CIV 3410 and CIV 3411. *Prereq.: Undergraduate course in soil mechanics.*

CIV 3420 Foundation Engineering I 2 Q.H.
(formerly 01.874)**Fall Quarter, Alternate Years**

Lateral earth pressure theory; retaining wall design; anchored bulkheads; braced cofferdams, dewatering, observational approach to design. *Prereq.: CIV 3411.*

CIV 3421 Foundation Engineering II 2 Q.H.
(formerly 01.875)**Winter Quarter, Alternate Years**

Bearing capacity, design of shallow foundations, site improvement (preloading, deep densification), case studies of foundation performance. *Prereq.: CIV 3420.*

CIV 3422 Foundation Engineering III 2 Q.H.
(formerly 01.876)**Spring Quarter, Alternate Years**

Pile foundations, caissons, selection of foundation scheme; case studies. *Prereq.: CIV 3421.*

CIV 3423 Foundation Engineering I and II 4 Q.H.
(formerly 01.878)**Spring Quarter**

Embodies the course content offered in CIV 3420 and CIV 3421. *Prereq.: CIV 3411 or CIV 3413.*

CIV 3430 Soil-Structure Interaction 4 Q.H.
(formerly 01.870)**Winter Quarter, Alternate Years**

Introduction to pile foundations; beam on elastic foundations; deformations of axially and laterally loaded single piles and pile groups using available computer software; pile load tests; case histories. *Prereq.: CIV 3411 or CIV 3413.*

CIV 3440 Experimental Soil Mechanics 4 Q.H.
(formerly 01.879)**Spring Quarter, Alternate Years**

Laboratory evaluation of engineering properties of soils with emphasis on permeability, compressibility and strength. Introduction to model analysis of static and dynamic behavior of soils. *Prereq.: CIV 3411 or CIV 3413.*

CIV 3450 Engineering Geology 2 Q.H.
(formerly 01.882)**Winter Quarter**

Selected topics in historical and structural geology related to engineering geology; origin and occurrence of various rock types, geologic structures, faulting and joint systems; weathering of rock and weathering products, glaciation, geologic mapping and environmental aspects. *Prereq.: Undergraduate course in geology.*

CIV 3470 Introduction to Structural and Soil Dynamics 2 Q.H.
(formerly 01.886)

Fall Quarter

Dynamic response analysis of one-degree-of-freedom systems, characteristics of earthquakes and resulting ground motions, response spectra, stress-strain behavior of soils during dynamic and repeated loading, laboratory and field determinations, wave propagation through elastic media, effect of local soil condition upon earthquake ground motions. *Prereq.: Admission to the Geotechnical Engineering Program.*

CIV 3471 Advanced Soil Dynamics 2 Q.H.
(formerly 01.887)

Winter Quarter

Dynamic response analysis of a single mass, multi-degree-of-freedom systems; machine foundation design and analysis; soil-structure interaction, ground vibrations, sources and control; shear strength during repeated loading, liquefaction; dynamic analysis of retaining structures and slopes. *Prereq.: CIV 3470.*

CIV 3480 Seismic Design 2 Q.H.
(formerly 01.850)

Spring Quarter

Earthquake considerations in building design process, dynamic analysis of multidegree-of-freedom elastic systems subjected to earthquake motions and cyclically applied forces, inelastic dynamic response analysis. Seismic provisions of building codes; soil-structure interaction. *Prereq.: CIV 3470.*

CIV 3485 Earthquake Engineering 2 Q.H.
(formerly 01.851)

Spring Quarter, Alternate Years

Seismic hazard and seismic risk analysis; seismic design decision analysis; lifeline earthquake engineering; pipelines, liquid storage tanks, water distribution systems; earthquake analysis of earth dams and slopes; dynamic analysis of retaining walls and offshore facilities; dynamically loaded piles. *Prereq.: CIV 3470.*

CIV 3510 Advanced Structural Mechanics I (formerly 01.841) 2 Q.H.

Fall Quarter

Analysis of force equilibrium (stress), deformation/ displacement (strain), and force/deformation (Hooke's Law) for an elastic solid; compatibility; governing equations for complete and approximate elasticity solution. Plane stress solution for narrow rectangular beams. Torsion, Saint Venant's theory, membrane analogy, rectangular sections, thin open and closed sections. Introduction to bending of thin plates. *Prereq.: Undergraduate structural mechanics and structural analysis.*

CIV 3511 Advanced Structural Mechanics II (formerly 01.842) 2 Q.H.

Winter Quarter

Consistent models for the mechanics of simple structural elements: axial, bending, plane stress, and the

like. Equilibrium, geometry of deformation, and force/deformation as the governing relations of all structural elements. Work and energy principles: virtual displacement, virtual forces, minimum potential energy, minimum complementary energy, introduction to variational ideas, Rayleigh-Ritz method. *Prereq.: CIV 3510.*

CIV 3520 Engineering Materials I 2 Q.H.
(formerly 01.824)

Winter Quarter

Mechanical, microstructural, physical and chemical properties of cements and concretes and their roles in structures, pavements, bridge decks, repair and rehabilitation will be covered. Different concretes such as expansive cement concrete, sulfate-resistant concrete, sulfur concrete and fiber-reinforced concrete will be introduced. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3521 Engineering Materials II 2 Q.H.
(formerly 01.825)

Spring Quarter

Topics include the elastic, plastic and viscoelastic properties of solids and composites; introduction to fracture mechanics and fatigue. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3525 Stability (formerly 01.859) 2 Q.H.

Spring Quarter

Prediction of the buckling loads in columns, behavior of beam columns, use of numerical methods to compute the buckling loads of nonprismatic members, buckling of plates. *Prereq.: CIV 3510 and CIV 3511.*

CIV 3530 Finite-Element Analysis of Structures I (formerly 01.843) 2 Q.H.

Spring Quarter

Introduction to finite-element method for structural analysis. Overview of direct stiffness method. Formulation of element stiffness matrices by direct use of elasticity relations and by energy methods for simple elements; axial, bending, plane stress, and plane strain; transformation of coordinate systems; lumping work equivalent loads; bounds on the error solution. Plate bending. Use of finite-element computer programs. *Prereq.: CIV 3511.*

CIV 3535 Advanced Structural Analysis 4 Q.H.
(formerly 01.845)

Winter Quarter

Offered days. Formulation and solution of structural problems with primary application to member systems (trusses, frames, curved members), matrix formulation of flexibility and stiffness methods: geometrically nonlinear behavior. *Prereq.: Admission to the Graduate School of Engineering.*

CIV 3540 Optimization in Structural Engineering (formerly 01.852) 4 Q.H.

Spring Quarter

Unconstrained and constrained optimization; Kuhn-Tucker condition: Sequential Unconstrained

Minimization Technique (SUMT); design sensitivity analysis; Gradient Projection Method (GRP). Although problem formulation is quite general, emphasis will be on the practical structural application where the displacement (stiffness) method is used as part of the structural-synthesis algorithm. Knowledge of FORTRAN assumed. *Prereq.: CIV 3535.*

CIV 3545 Structural Dynamics 4 Q.H.
(formerly 01.857)

Fall Quarter

Single degree-of-freedom structural systems, free vibration, forced vibration, Duhamel integral, time step integration, multidegree-of-freedom structural systems, model analysis, damping, response spectra, nonlinear systems, earthquake ground motions. *Prereq.: concurrently with CIV 3535.*

CIV 3550 Finite Element Procedures 4 Q.H.
in Engineering Analysis (formerly 01.890)

Winter Quarter

Finite elements and finite differences methods for analysis of linear and nonlinear problems in solid, structural, and fluid mechanics. Computer-based numerical solutions in statics and dynamics (model analysis and direct integration). Eigensolution algorithms. Applications: forced vibration analysis, earthquakes, offshore, structural analysis. *Prereq.: CIV 3535 and CIV 3545.*

CIV 3560 Prestressed Concrete 2 Q.H.
(formerly 01.853)

Fall Quarter

Fundamentals of prestressing; design of prestressed concrete beams for flexure and shear; design of end blocks; load balancing method for the analysis of indeterminate prestressed structures; column design. *Prereq.: Undergraduate Reinforced Concrete Design and Structural Analysis.*

CIV 3561 Reinforced Concrete Slabs 2 Q.H.
(formerly 01.854)

Fall Quarter

Design of two-way slabs by the equivalent frame method; yield line theory; prestressing of slabs; the strip method; and introduction to folded plate design. *Prereq.: Undergraduate Reinforced Concrete Design and Structural Analysis.*

CIV 3562 Concrete Folded Plates and Shells 2 Q.H.
(formerly 01.855)

Spring Quarter

Additional topics of folded plate design, design of thin shelled structures including hyperbolic paraboloids and shells of revolution. *Prereq.: CIV 3561.*

CIV 3570 Elastic Steel Design 2 Q.H.
(formerly 01.861)

Fall Quarter

An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind and seismic loads are considered. *Prereq.: Undergraduate Steel Design and Structural Analysis.*

CIV 3571 Plastic Steel Design 2 Q.H.
(formerly 01.862)

Winter Quarter

An advanced course in analysis and design in structural steel with emphasis on plastic behavior including rigid frame buildings and braced multistory frame buildings. *Prereq.: Undergraduate Steel Design and Structural Analysis.*

CIV 3572 Selected Topics of Steel Design 2 Q.H.
(formerly 01.863)

Spring Quarter, Alternate Years

Advanced problems in elastic and plastic design of structural steel. Topics include curved girders, cable supported structures, fatigue considerations, and composite sections with steel deck. *Prereq.: Undergraduate Steel Design and Structural Analysis.*

CIV 3580 Computer-Aided Structural Design 4 Q.H.
(formerly 01.848)

Fall Quarter

General characteristics of computer aided design software, development of software for the solution of typical structural steel and reinforced concrete design problems. *Prereq.: CIV 3535.*

CIV 3610 Urban Public Transportation 2 Q.H.
(formerly 01.811)

Fall Quarter

Analysis and planning of public transportation systems, including bus, subway, commuter rail, and paratransit; performance prediction; service evaluation and efficiency control measure; demand prediction; institutional and economic issues. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3630 Traffic Engineering 2 Q.H.
(formerly 01.817)

Spring Quarter

Measurement of traffic characteristics and system performance; theory of traffic flow and analytical techniques; systems hardware design and evaluation; current concerns of energy, environmental, and urban amenity impacts; computer applications and institutional characteristics. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3635 Transportation Engineering 2 Q.H.
(formerly 01.820)

Winter Quarter

Description and evaluation of different modes of transportation existing and proposed; their performance and cost characteristics; design, performance, and selection criteria for vehicles and roadbeds. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3640 Theory and Practice of Transportation Planning I 2 Q.H.
(formerly 01.835)

Fall Quarter

Establishments of goals, objectives and criteria; the current planning framework; examination of performance characteristics of transportation systems, including public and private modes on land, water, and airways. *Prereq.: Admission to Graduate School of Engineering.*

CIV 3641 Theory and Practice of Transportation Planning II (formerly 01.836)**2 Q.H.****Fall Quarter**

Continuation of CIV 3640. Transportation demand modeling from regional economic analysis to traffic and public transportation network assignment; technical and economic evaluation; current issues, including environmental assessment, transportation systems management, citizen participation, and planning in developing countries. *Prereq.: CIV 3640 to be taken previously or concurrently.*

CIV 3650 Urban Transportation Analysis I (formerly 01.815)**2 Q.H.****Winter Quarter, Alternate Years**

Principles of analysis of urban transportation systems including travel demand equilibrium, performance and evaluation techniques using aggregate and disaggregate methods. *Prereq.: CIV 3641 and appropriate graduate statistics courses.*

CIV 3651 Urban Transportation Analysis II (formerly 01.816)**2 Q.H.****Spring Quarter, Alternate Years**

Continuation of CIV 3650. Conceptualization, formulation, application, and evaluation of mathematical models utilized in urban transportation systems analysis; case studies of representative analyses. The objective of this course is to help prepare students to conceptualize, formulate, apply and evaluate appropriate mathematical modeling techniques in transportation. *Prereq.: CIV 3650.*

CIV 3798 Master's Thesis Continuation (formerly 01.9X1)**0 Q.H.****Any Quarter****CIV 3799 PhD Continuation (formerly 01.9X4)****0 Q.H.****Any Quarter****CIV 3830 Special Topic in Civil Engineering (formerly 01.992)****2 Q.H.****Fall, Winter, Spring Quarters**

Topics of interest to the staff member conducting this course are presented for advanced study. The

course is initiated by the appropriate discipline committee and approved by the department. *Prereq.: Consent of the instructor.*

CIV 3835 Special Project in Civil Engineering (formerly 01.995)**2 Q.H.****Any Quarter**

An individual effort in an area selected by student and adviser and approved by the Departmental Discipline Committee resulting in a definitive report. *Prereq.: Permission of the department.*

CIV 3850 Master's Report (formerly 01.993)**4 Q.H.****Any Quarter**

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of civil engineering selected by student and adviser resulting in a definitive report. *Prereq.: Permission of the Civil Engineering Department.*

CIV 3851 Master's Report**2 Q.H.****Any Quarter****CIV 3860 Master's Thesis (formerly 01.991)****8 Q.H.****Any Quarter**

Analytical and/or experimental research conducted by arrangement with and under the supervision of the department. *Prereq.: Permission of the Civil Engineering Department.*

CIV 3861 Master's Thesis**4 Q.H.****Any Quarter****CIV 3862 Master's Thesis****2 Q.H.****Any Quarter****CIV 3880 PhD Thesis (formerly 01.997)****0 Q.H.****Any Quarter**

Open to full-time Doctoral students only. *Prep. Admission to doctoral program in Civil Engineering.*

Interdisciplinary Transportation

INT 3798 Master's Thesis Continuation**0 Q.H.****Any Quarter****INT 3835 Special Project in Transportation (formerly 93.818)****2 Q.H.****Any Quarter**

An individual effort in an area selected by student and adviser resulting in a definite report. *Prereq.: Permission of the Civil Engineering Department.*

INT 3850 Master's Report in Transportation (formerly 93.819)**4 Q.H.****Any Quarter**

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced

design of a project in an area of transportation selected by student and adviser resulting in a definitive report. *Prereq.: Permission of the Civil Engineering Department.*

INT 3860 Master's Thesis in Transportation (formerly 93.820)**8 Q.H.****Any Quarter**

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prereq.: Permission of the Civil Engineering Department.*

Electrical and Computer Engineering

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time.

ECE 3100 Introduction to Circuits and Systems (formerly 03.846) 4 Q.H.

Fall Quarter

The circuit elements (R, L and C) are introduced. Kirchoff's laws, Tellegen and Thevenin's theorem. Mesh and nodal analysis. Development of system function approach, Laplace and Fourier transform theory applied to circuit analysis. Sinusoidal steady-state, n-port network theory, and power and energy concepts. *Prereq.: Admission to Graduate School.*

ECE 3101 Introduction to Electronics (formerly 03.847) 4 Q.H.

Winter Quarter

Characteristics of the theoretical physical junction. The Ebers-Moll model for bipolar junction transistors, characteristics of bipolar and field-effect devices, basic digital inverters and logic gates and various logic families. Use of transistors in the design of analog circuits. Biasing, linearized incremental models, load lines, signal flowgraphs, frequency response and gain calculation for single and cascaded stages. *Prereq.: ECE 3100 or equivalent.*

ECE 3102 Introduction to Electromagnetic Field Theory (formerly 03.848) 4 Q.H.

Spring Quarter

Definition of scalar and vector fields; vector calculus; concepts of gradient, divergence, curl and the "del" operator; free-space electrostatics; the generalization of the Maxwell equations to the case of time-varying fields; Faraday induction law, wave equations and the plane wave solution. *Prereq.: ECE 3100 or equivalent.*

ECE 3103 Introduction to Digital Computers (formerly 03.849) 4 Q.H.

Fall Quarter

Basic components of digital systems and methods for their analysis and design, combinational and sequential circuits, integrated circuit logic families and functional building blocks, registers, counters, decoders, multiplexers and memories. Data representation and coding techniques. Central processor alternatives; instruction formats, addressing modes, bus structures, arithmetic units, timing analysis and stacks. Algorithms for arithmetic operations with various data representations. *Prereq.: Admission to Graduate School.*

ECE 3104 Introduction to Communications (formerly 03.850) 4 Q.H.

Spring Quarter

Review of system theory, convolution, Fourier series, Fourier integral, signal analysis, Fourier methods, correlation functions, density functions, power

spectra, amplitude modulation, frequency modulation, phase modulation, sampling theory and digital modulation techniques. *Prereq.: ECE 3108 or equivalent.*

ECE 3105 Introduction to System Software I 2 Q.H.

Fall Quarter

A knowledge of PASCAL is helpful but not required for this course. Programming style considerations, software testing and software reliability. Data structures, including stacks, queues, linked lists, trees and graphs. The course emphasizes the use of PASCAL to implement typical system software routines that use the above data structures. Miscellaneous topics also discussed are modern system software considerations for multiprocessor, array processor and graphic processor systems. *Prereq.: Admission to Graduate School.*

ECE 3106 Introduction to Systems Software II 2 Q.H.

Winter Quarter

An analysis of absolute and relocatable program translators. The topics covered are assemblers, disassemblers, macroassemblers, linkers, an overview of compilers, interpreters, simulators and emulators. For a typical lab assignment, the student will design and implement an absolute assembler for a very simplified instruction set. *Prereq.: ECE 3105.*

ECE 3107 Introduction to System Software III 2 Q.H.

Spring Quarter

An analysis of operating system structure and concepts. Memory management, fragmentation, paging, virtual memory, job and process scheduling, I/O management, file management. Operating system concepts for multiuser systems. Critical variables, race conditions, Dekker's algorithm, some sample multiuser routines. For a typical lab assignment, the student will write simulated paged memory management and process scheduling routines. *Prereq.: ECE 3106.*

ECE 3108 Introduction to Signals and Systems 4 Q.H.

Winter Quarter

Description and analysis of continuous and discrete signals and systems. Properties of systems. The input-output relationship of linear time-invariant systems. Discrete and continuous Fourier series and Fourier transforms. Laplace and z-transforms. Elements of filtering and sampling. *Prereq.: ECE 3100 or equivalent.*

ECE 3120 Power Circuit Analysis I **2 Q.H.**
(formerly 03.925)**Fall Quarter**

Fundamental concepts of single-phase and poly-phase power systems; definitions of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase systems; introduction of symmetrical components; short circuits on systems with a single power source. *Prereq.: BSEE or ECE 3100 and ECE 3102.*

ECE 3130 Electrical Machinery Theory I **2 Q.H.**
(formerly 03.940)**Fall Quarter**

Review of magnetic circuit concepts and electromechanical energy-conversion principles; steady-state analysis of transformers, synchronous machines, and induction machines. *Prereq.: BSEE or ECE 3100 and ECE 3102.*

ECE 3200 Mathematical Methods in Computer Science (formerly 03.8A1) **2 Q.H.****Fall Quarter**

Algebraic concepts relevant to computer science; sets, relations, mapping, orderings, algebraic systems, Boolean algebras, groups, rings, finite fields, introduction to vector spaces and linear algebras over finite fields. *Prereq.: Admission to Graduate School.*

ECE 3211 Mathematical Methods in EE I **4 Q.H.**
(formerly 03.823)**Fall and Winter Quarters**

Fundamental Algebraic Concepts; Sets, functions, relations, operations; Algebraic Structures; group, rings, fields, homomorphisms, polynomials; Vector Spaces and Linear Operators; representations, matrices and linear algebraic equations, orthogonality, equivalence and similarity transformations, eigenvalues and eigenvectors, canonical forms, functions of a square matrix, quadratic forms and congruence transformations, orthogonal transformations; Introduction to Polynomial Matrices; Applications to Communications and Control Theory. *Prereq.: Admission to Graduate School.*

ECE 3212 Mathematical Methods in Electrical Engineering I-A **2 Q.H.****Fall and Winter Quarters**

ECE 3212 and ECE 3213 cover the same material with the same prerequisites as ECE 3211, but in two 2 Q.H. courses.

ECE 3213 Mathematical Methods in Electrical Engineering I-B **2 Q.H.****Winter and Spring Quarters**

Continuation of ECE 3212. *Prereq.: ECE 3212.*

ECE 3221 Linear Systems Analysis **4 Q.H.**
(formerly 03.827)**Fall and Winter Quarters**

Introduction to the state variable theory of continuous and discrete linear systems. Standard canonical representations. The concept of state and the representation of interconnected systems. Linear spaces. The state equations and their solution. Stability.

Introduction to the general control problem in terms of controllability and observability. *Prereq.: ECE 3211, ECE 3108 or equivalent.*

ECE 3222 Linear Systems Analysis A **2 Q.H.**
(formerly 03.825)**Fall and Winter Quarters**

ECE 3222 and ECE 3223 cover the same material with the same prerequisites as ECE 3221, but in two 2 Q.H. courses.

ECE 3223 Linear Systems Analysis B **2 Q.H.**
(formerly 03.826)**Winter and Spring Quarters**

Continuation of ECE 3222. *Prereq.: ECE 3222.*

ECE 3231 Mathematical Methods in EE II **4 Q.H.**
Summer Quarter

Complex variable theory; Analytic functions and Cauchy-Riemann equations, complex integration and Cauchy integral formula, Taylor and Laurent Series, the residue theorem, conformal mapping; Laplace transform and its applications, Problems in partial differential equations; Generalized Fourier Series and Green's functions; General integral transforms; Sturm-Liouville, Fourier, Hankel, Legendre and other integral transforms. *Prereq.: Admission to Graduate School.*

ECE 3232 Mathematical Methods in Electrical Engineering II-A (formerly 03.8C1) **2 Q.H.****Summer Quarter**

ECE 3232 and ECE 3233 cover the same material with the same prerequisites as ECE 3231, but in two 2 Q.H. courses.

ECE 3233 Mathematical Methods in Electrical Engineering II-B (formerly 03.8C2) **2 Q.H.****Summer Quarter**

Continuation of ECE 3232. *Prereq.: ECE 3232.*

ECE 3241 Applied Probability and Stochastic Processes (formerly 03.902) **4 Q.H.****Fall and Winter Quarters**

Introductory probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, description of stochastic vectors. General concepts of stochastic processes, stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, matched filtering, stochastic orthogonality and linear mean-square estimation filtering and prediction. *Prereq.: ECE 3108 or equivalent.*

ECE 3242 Applied Probability and Stochastic Processes A (formerly 03.900) **2 Q.H.****Fall and Winter Quarters**

ECE 3242 and ECE 3243 cover the same material with the same prerequisites as ECE 3241, but in two 2 Q.H. courses.

- ECE 3243 Applied Probability and Stochastic Processes B (formerly 03.901)** **2 Q.H.**
Winter and Spring Quarters
 Continuation of ECE 3242. *Prereq.: ECE 3242.*
- ECE 3302 Power Circuit Analysis II (formerly 03.926)** **2 Q.H.**
Winter Quarter
 This course is a continuation of ECE 3120 Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from an application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems. *Prereq.: ECE 3120.*
- ECE 3303 Power Circuit Analysis III (formerly 03.927)** **2 Q.H.**
Spring Quarter
 This course is a continuation of ECE 3302, Power Circuit Analysis II. Introduction of Clarke components and applications in analysis of asymmetrical systems and faults; application of Clarke components to the solution of surge phenomena problems; transmission line theory; fundamentals of systems stability. *Prereq.: ECE 3302.*
- ECE 3304 Solid State AC and DC Motor Control Systems (formerly 03.929)** **2 Q.H.**
Winter Quarter
 The application of solid-state devices to the control of AC and DC electrical machinery, including rectifiers, inverters, choppers and cyclo-converters, as applied to drive systems in industry and transportation. The course will emphasize a case method approach. *Prereq.: BSEE or ECE 3100 and ECE 3101.*
- ECE 3305 Computers in Power Systems I (formerly 03.935)** **2 Q.H.**
Fall Quarter
 Techniques used in solving power system problems with the digital computer. Matrix formulations are examined, followed by a detailed treatment of the short-circuit problem, including balanced and unbalanced faults. Various iterative techniques are studied for the solution of the power-flow problem. *Prereq.: ECE 3120.*
- ECE 3306 Computers in Power Systems II (formerly 03.936)** **2 Q.H.**
Winter Quarter
 Practical considerations of solving large scale networks are discussed. Network reductions, distribution factors and contingency analysis techniques are developed. Digital models for regulated generators, fixed and load tap changing transformers and HVDC transmission lines are examined. Computer methods for economic dispatch, loss coefficients and application of pumped hydro are developed. *Prereq.: ECE 3305.*

- ECE 3308 Electrical Machinery Theory II (formerly 03.941)** **2 Q.H.**
Winter Quarter
 Mathematical description of a synchronous machine; per-unit representation; steady-state theory and transient performance; flux distribution and saturation in synchronous machines. *Prereq.: ECE 3130.*
- ECE 3309 Electrical Machinery Theory III (formerly 03.942)** **2 Q.H.**
Spring Quarter
 Review of transient behavior of synchronous machines; stability studies and excitation systems; synchronous machine modeling; generator protection; trends in development of large generators. *Prereq.: ECE 3308.*
- ECE 3311 Software Engineering I (formerly 03.896)** **4 Q.H.**
Fall Quarter
 An introduction to basic concepts in software engineering principles is given. Techniques of structured software design and testing are discussed along with issues of program reliability and complexity. Management techniques are touched upon and a case study of a typical large software problem is undertaken. *Prereq.: ECE 3105, 3106, 3107 or equivalent, and a knowledge of a high-level programming language.*
- ECE 3312 Software Engineering I-A (formerly 03.893)** **2 Q.H.**
Fall and Winter Quarters
 ECE 3312 and ECE 3313 cover the same material with the same prerequisites as ECE 3311, but in two 2 Q.H. courses.
- ECE 3313 Software Engineering I-B (formerly 03.894)** **2 Q.H.**
Winter and Spring Quarters
 Continuation of ECE 3312. *Prereq.: ECE 3312.*
- ECE 3314 Software Engineering II (formerly 03.895)** **2 Q.H.**
Spring Quarter
 Focus turns away from the general issues of the first two courses in this sequence and toward a very specific issue, modular design of software. Issues of stepwise refinement and top-down design are explored in depth, and organizational/data-flow issues are considered. *Prereq.: ECE 3311 or 3313.*
- ECE 3321 Digital Signal Processing (formerly 03.8T9)** **4 Q.H.**
Winter Quarter
 Theory and practice of modern signal processing techniques. Characteristics of discrete signals and systems; sampling and A/D conversion; difference equations; convolution; the z-transform, the Fourier transform and the discrete Fourier transform; fast Fourier transform algorithms; chirp z-transform algorithm; digital filter realizations; design techniques for IIR and FIR digital filters; computer programs for filter design; quantization effects in digital signal processing. *Prereq.: ECE 3221.*

**ECE 3322 Digital Signal Processing A 2 Q.H.
(formerly 03.877)****Fall and Winter Quarters**

ECE 3322 and ECE 3323 cover the same material with the same prerequisites as ECE 3321, but in two 2 Q.H. courses.

**ECE 3323 Digital Signal Processing B 2 Q.H.
(formerly 03.878)****Winter and Spring Quarters**

Continuation of ECE 3322. *Prereq.: ECE 3322.*

**ECE 3325 Numerical Methods and
Computer Applications I (formerly 03.8T0) 4 Q.H.
Winter Quarter**

Survey of numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving; roundoff errors and cumulative errors; difference and summation calculus; roots of polynomials and nonlinear functions; orthogonal functions including polynomial, least squares, and Chebyshev approximation of functions; Interpolation; numeric quadrature; numeric integration of ordinary differential equations. *Prereq.: Admission to Graduate School and a working knowledge of FORTRAN.*

**ECE 3326 Numerical Methods and
Computer Applications I-A (formerly 03.8T1) 2 Q.H.
Fall and Winter Quarters**

ECE 3326 and ECE 3327 cover the same material with the same prerequisites as ECE 3325, but in two 2 Q.H. courses.

**ECE 3327 Numerical Methods and
Computers Applications I-B (formerly 03.8T2) 2 Q.H.
Winter and Spring Quarters**

Continuation of ECE 3326. *Prereq.: ECE 3326.*

**ECE 3328 Numerical Methods and
Computer Applications II (formerly 03.8T3) 4 Q.H.
Spring Quarter**

Spectral analysis, including fast Fourier transforms, Hilbert transforms, convolution, and correlation techniques. Optimization, including dynamic programming and steepest descent techniques. PERT and linear programming. Other selected topics. *Prereq.: ECE 3325 or ECE 3327.*

**ECE 3331 Analog Integrated Circuits 4 Q.H.
(formerly 03.842)****Fall Quarter**

Active transistor circuits and systems are treated with emphasis on modern integrated circuit architectures. Bipolar and field-effect (NMOS and CMOS) implementations of analog circuits are presented. Characteristics and behaviors of analog I.C. structures are explored through the study of circuits such as, operational amplifiers, instrumentation amplifiers, voltage comparators, various types of filter configuration and integrators as well as multipliers and logarithmic amplifiers. Features covered include linearity, dynamic range, slew-rate limiting and speed and gain-bandwidth trade-offs. The role of feedback

in stabilizing, linearizing and otherwise enhancing the performance of analog circuits is treated in detail. Noise limitations on circuit performance are explored. Noise models of devices and circuits are developed, leading to the prediction of system noise performance and techniques for optimizing signal-to-noise-ratios. *Prereq.: ECE 3101 or equivalent.*

**ECE 3332 Analog Integrated Circuits A 2 Q.H.
(formerly 03.840)****Fall Quarter**

ECE 3332 and ECE 3333 cover the same material with the same prerequisites as ECE 3331, but in two 2 Q.H. courses.

**ECE 3333 Analog Integrated Circuits B 2 Q.H.
(formerly 03.841)****Winter Quarter**

Continuation of ECE 3332. *Prereq.: ECE 3332.*

**ECE 3341 Electromagnetic Theory 4 Q.H.
(formerly 03.877)****Fall Quarter**

Review of Maxwell's equations, boundary conditions and density functions. Potential functions, electromagnetic force and energy, propagation of electromagnetic waves in bounded and unbounded media; general theorems for the electromagnetic field, scattering and diffraction, application to the dipole antenna. *Prereq.: ECE 3102 or equivalent.*

**ECE 3342 Electromagnetic Theory A 2 Q.H.
(formerly 03.875)****Fall Quarter**

ECE 3342 and ECE 3343 cover the same material with the same prerequisites as ECE 3341, but in two 2 Q.H. courses.

**ECE 3343 Electromagnetic Theory B 2 Q.H.
(formerly 03.876)****Winter Quarter**

Continuation of ECE 3342. *Prereq.: ECE 3342.*

**ECE 3344 Principles of Microwave 4 Q.H.
Engineering**

Generation of microwaves; transmission of waves in uniform and periodic structures, waveguides, strip-line, microstrip and dielectric waveguides. Cavity resonators. Equivalent circuit representations, scattering parameters. Circulators and isolators. High power devices: klystrons, magnetrons and travelling-wave tubes, ferrite devices and gyrators. *Prereq.: ECE 3341.*

**ECE 3345 Principles of Microwave 2 Q.H.
Engineering A****Winter Quarter**

ECE 3345 and ECE 3346 cover the same material with the same prerequisites as ECE 3344, but in two 2 Q.H. courses.

**ECE 3346 Principles of Microwave 2 Q.H.
Engineering B****Spring Quarter**

Continuation of ECE 3345. *Prereq.: ECE 3345.*

ECE 3347 Computational Methods in Electromagnetics (formerly 03.8H7) Spring Quarter **4 Q.H.**

Solutions to complex electromagnetic problems are presented using a variety of numerical and computational techniques. These techniques include: finite element methods, moment and functional methods. Applications will be made to applied problems and physical aspects will be emphasized. *Prep: ECE 3341.*

ECE 3348 Computational Methods in Electromagnetics A (formerly 03.8H5) Fall Quarter **2 Q.H.**

ECE 3348 and ECE 3349 cover the same material with the same prerequisites as ECE 3347, but in two 2 Q.H. courses.

ECE 3349 Computational Methods in Electromagnetics B (formerly 03.8H6) Winter Quarter **2 Q.H.**

Continuation of ECE 3348. *Prereq.: ECE 3348.*

ECE 3351 Digital Communications (formerly 03.9C3) Winter Quarter **4 Q.H.**

Deals with the theoretical and practical aspects of digital communications in the presence of channel distortion and additive noise. Topics covered include the basic binary and M-ary modulation techniques, namely, PSK, PAM, FSK, orthogonal and biorthogonal signals, and their performance in an additive Gaussian noise channel; signal waveforms constructed from binary block and convolutional codes; hard-decision decoding and soft-decision decoding of coded signal waveforms; performance of coded waveforms in an additive white Gaussian noise channel. Signal design techniques for band-limited channels; Nyquist criteria; effect of channel amplitude and delay distortion on digital signals; discussion of several adaptive equalization algorithms for combating intersymbol interference; maximum likelihood sequence estimation and the Viterbi algorithm; the characterization of fading multipath channels; diversity reception techniques; coding for fading channels. *Prereq.: ECE 3241 and ECE 3104 or equivalent.*

ECE 3352 Digital Communications A (formerly 03.9C1) Fall Quarter **2 Q.H.**

ECE 3352 and ECE 3353 cover the same material with the same prerequisites as ECE 3351, but in two 2 Q.H. courses.

ECE 3353 Digital Communications B (formerly 03.9C2) Winter Quarter **2 Q.H.**

Continuation of ECE 3352. *Prereq.: ECE 3352.*

ECE 3361 Detection and Estimation Theory (formerly 03.909) Winter Quarter **4 Q.H.**

This course presents the classical theory of detection and estimation of signals in noise with emphasis

on computer implementation of the theory. Particular topics include: hypothesis testing criteria; coherent detection of M-ary signals; diversity receiver; calculation of error probabilities. Detection in colored noise; parameter estimation using Bayes, maximum-likelihood, a maximum a posteriori criteria; applications in pattern recognition and radar. *Prereq.: ECE 3241.*

ECE 3362 Detection and Estimation Theory A (formerly 03.906) Winter Quarter **2 Q.H.**

ECE 3362 and ECE 3363 cover the same material with the same prerequisites as ECE 3361, but in two 2 Q.H. courses.

ECE 3363 Detection and Estimation Theory B (formerly 03.907) Spring Quarter **2 Q.H.**

Continuation of ECE 3362. *Prereq.: ECE 3362.*

ECE 3371 Linear Optimal Control Theory (formerly 03.9A8) Spring Quarter **4 Q.H.**

Single-stage extrema problem; Lagrange multiplier method. Multi-stage extrema problems; calculus of variations. Hamiltonian, maximum principle, and dynamic programming. Examples and problems such as the linear regulator-servomechanism problem, minimum fuel-time problem and bang-bang control problem are treated. *Prep: ECE 3221 and 3381.*

ECE 3372 Linear Optimal Control Theory A (formerly 03.9A6) Winter Quarter **2 Q.H.**

ECE 3372 and ECE 3373 cover the same material with the same prerequisites as ECE 3371, but in two 2 Q.H. courses.

ECE 3373 Linear Optimal Control Theory B (formerly 03.9A7) Spring Quarter **2 Q.H.**

Continuation of ECE 3372. *Prereq.: ECE 3372.*

ECE 3381 Classical Control Theory (formerly 03.959) Fall Quarter **4 Q.H.**

Basic systems modeling; steady state and transient response analysis. Introduction to root-locus plots, Bode plots, Nyquist plots, and Nichols chart. The design of first order cascade and feedback compensators using the above plots. Pole-zero synthesis techniques and design techniques for the optimal linear regulator problem. *Prep: ECE 3108 or equivalent.*

ECE 3382 Classical Control Theory A (formerly 03.957) Fall Quarter **2 Q.H.**

ECE 3382 and ECE 3383 cover the same material with the same prerequisites as ECE 3381, but in two 2 Q.H. courses.

ECE 3383 Classical Control Theory B (formerly 03.958) Winter Quarter **2 Q.H.**

Continuation of ECE 3382. *Prereq.: ECE 3382.*

ECE 3384 Characteristics and Models of Solid State Devices I (formerly 03.8G0) **4 Q.H.****Winter Quarter**

This course is designed to develop insight into the physics of semiconductors and the operation of semiconductor devices. Some of the important topics include: crystal structure, energy bands, carrier concentration at thermal equilibrium, semiconductor statistics, carrier transport phenomena, p-n junction theory, charge storage and diode transients, bipolar junction transistors, charge-control model, Gummel-Poon model. *Prereq.: ECE 3101 and 3102 or equivalent.*

ECE 3385 Characteristics and Models of Solid State Devices I-A (formerly 03.8G1) **2 Q.H.****Fall Quarter**

ECE 3385 and ECE 3386 cover the same material with the same prerequisites as ECE 3384, but in two 2 Q.H. courses.

ECE 3386 Characteristics and Models of Solid State Devices I-B (formerly 03.8G2) **2 Q.H.****Winter Quarter**

Continuation of ECE 3385. *Prereq.: ECE 3385.*

ECE 3388 Characteristics and Models of Solid State Devices II **4 Q.H.**

Metal-semiconductor contacts, methods of measurement of barrier height, MIS diode, C-V measurement to evaluate the interface-trapped charges; MOSFET device and structure, device scaling and second-order effects, CMOS structure; solid state microwave devices like MESFET, MODFET, and heterojunction bipolar transistor (HBT) will be discussed. An examination of noise in the microwave devices will be included. *Prereq.: ECE 3384.*

ECE 3389 Characteristics and Models of Solid State Devices II-A **2 Q.H.**

ECE 3389 and 3390 cover the same material with the same prerequisites as ECE 3388, but in two Q.H. courses. *Prereq.: ECE 3384.*

ECE 3390 Characteristics and Models of Solid State Devices II-B **2 Q.H.**

Continuation of ECE 3389. *Prereq.: ECE 3389.*

ECE 3391 Digital Computer Architecture (formerly 03.979) **4 Q.H.**

Hardware Description Languages; the PDP-11 as a base architecture; VAX, 68000, 16000, RIDGE and 8086 as alternatives; ALU design a bit-slice example at the LSI level; ALU design-resource allocation in a complex ALU; memory design—problems of speed and dynamic allocations; RISC vs. elaborate micro-code—philosophy and practical examples. *Prep: ECE 3103 or equivalent.*

ECE 3392 Digital Computer Architecture A (formerly 03.972) **2 Q.H.****Fall and Winter Quarters**

ECE 3392 and ECE 3393 cover the same material with the same prerequisites as ECE 3391, but in two 2 Q.H. courses.

ECE 3393 Digital Computer Architecture B (formerly 03.973) **2 Q.H.****Winter and Spring Quarters**

Continuation of ECE 3392. *Prereq.: ECE 3392*

ECE 3394 Microprogramming (formerly 03.974) **2 Q.H.****Spring Quarter**

Topics in microprogramming and emulation including microprogramming concepts and techniques; microprogramming design approach using register transfer notation and precedence graphs; microprogrammed computers, bit-slice microprogramming, microprogramming a specific machine for emulation using a microprogramming language and its simulator; current trends in microprogramming languages and support tools. *Prereq.: ECE 3391 or ECE 3393.*

ECE 3395 VLSI Design (formerly 03.8E6) **4 Q.H.****Spring Quarter**

MOS devices and circuits, electrical and logic design, logic arrays; fabrication, design rules, electrical parameters, delays; NMOS and CMOS subsystem design, examples; laboratory design project including layout design and verification. *Prereq.: ECE 3101 and 3103 or equivalent.*

ECE 3396 VLSI Design A (formerly 03.8E4) **2 Q.H.****Fall Quarter**

ECE 3396 and ECE 3397 cover the same material with the same prerequisites as ECE 3395, but in two 2 Q.H. courses.

ECE 3397 VLSI Design B (formerly 03.8E5) **2 Q.H.****Winter Quarter**

Continuation of ECE 3396. *Prereq.: ECE 3396.*

ECE 3398 VLSI Architectures **4 Q.H.**

System clocking and system design issues; control path and data path design; systolic arrays; bit serial architectures; design for testability; introduction to silicon compilation; laboratory project. *Prereq.: ECE 3395.*

ECE 3399 VLSI Architectures A **2 Q.H.**

ECE 3399 and 3400 cover the same material with the same prerequisites as ECE 3398, but in two 2 Q.H. courses. *Prereq.: ECE 3395.*

ECE 3400 VLSI Architectures B **2 Q.H.**

Continuation of ECE 3399. *Prereq.: ECE 3399.*

ECE 3412 Power System Planning (formerly 03.931) **4 Q.H.****Spring Quarter**

Engineering and economic considerations underlying the planning and development of modern interconnected power systems. Consideration of overall planning strategies involved in economic comparison of alternative development schemes. *Prereq.: ECE 3120.*

ECE 3415 Power Systems Protection 2 Q.H.
(formerly 03.932)**Winter Quarter**

Consideration of protection applied to generation, transmission, and distribution. Investigation of the characteristics and operating principles of various methods of protective relaying; analysis of current techniques pertaining to system protection. *Prereq.: ECE 3303.*

ECE 3416 Power System Transients 2 Q.H.
(formerly 03.933)**Fall Quarter**

Transients in power systems due to system switching, lightning, or faults. Traveling-wave phenomena; insulation coordination; overvoltages due to disturbances on the system; surge protection. *Prereq.: ECE 3303.*

ECE 3423 Special Topics in Power 2 Q.H.
(formerly 03.944)**Spring Quarter**

Directed reading and discussion of topics of special interest in the power field. Series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prereq.: Permission of Instructor.*

ECE 3424 Power System Dynamics 2 Q.H.
(formerly 03.945)**Spring Quarter**

Transient system models; small and large scale oscillations; solution of swing equation for single and multigenerator cases; load frequency and voltage controllers and transient stability. *Prereq.: ECE 3303.*

ECE 3430 Studies in Electric Power 2 Q.H.
Transmission II (formerly 03.955)**Fall Quarter**

Elements in the design of AC overhead transmission lines; thermal limitation, series and shunt compensation, environmental effects; consideration of transposition, induced effects, and insulation level. Underground alternatives to overhead lines. Elements of distribution. *Prereq.: ECE 3303.*

ECE 3431 Studies in Electric Power 2 Q.H.
Transmission II (formerly 03.956)**Winter Quarter**

Fundamental concepts of high voltage DC power transmission; rectifier and inverter performance; regulation; protection; reactive power and filter requirements; practical arrangement of DC lines; the impact of a DC line on overall power system operation. *Prereq.: ECE 3303.*

ECE 3440 Microprocessor-Based Design 4 Q.H.
(formerly 03.8F3)**Spring Quarter**

Bus interconnections; modular programming and I/O programming; serial and parallel interfacing; some peripheral chips; multiprogramming; multiprocessing; bit-slicing. *Prep.: ECE 3391.*

ECE 3441 Microprocessor-Based Design A 2 Q.H.
(formerly 03.8F1)**Fall Quarter**

ECE 3441 and ECE 3442 cover the same material with the same prerequisites as ECE 3440, but in two 2 Q.H. courses.

ECE 3442 Microprocessor-Based Design B 2 Q.H.
(formerly 03.8F2)**Winter Quarter**

Continuation of ECE 3441. *Prereq.: ECE 3441.*

ECE 3443 Theory of Computation 4 Q.H.
(formerly 03.8F0)**Spring Quarter**

This course deals with basic abstract models of computation. Topics include Turing machines, primitive recursive functions, recursive systems of equations and abstract families of algorithms. Unsolvable problems are examined, along with the Recursion Theorem. *Prereq.: ECE 3200.*

ECE 3444 Theory of Computation A 2 Q.H.
(formerly 03.985)**Fall Quarter**

ECE 3444 and ECE 3445 cover the same material with the same prerequisites as ECE 3443, but in two 2 Q.H. courses.

ECE 3445 Theory of Computation B 2 Q.H.
(formerly 03.986)**Winter Quarter**

Continuation of ECE 3444. *Prereq.: ECE 3444.*

ECE 3447 Switching Theory I 4 Q.H.
(formerly 03.966)**Spring Quarter**

Logical design of combinational switching circuits, including minimization and decomposition of switching functions; multiple output networks; symmetric networks; threshold logic, fault detection. Logic design of sequential switching circuits including finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. Logical design of sequential switching circuits, including the finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. *Prereq.: ECE 3200.*

ECE 3448 Switching Theory I-A 2 Q.H.
(formerly 03.967)**Fall Quarter**

ECE 3448 and ECE 3449 cover the same material with the same prerequisites as ECE 3447, but in two 2 Q.H. courses.

ECE 3449 Switching Theory I-B 2 Q.H.
(formerly 03.968)**Winter Quarter**

Continuation of ECE 3448. *Prereq.: ECE 3448.*

ECE 3450 Switching Theory II **2 Q.H.**
(formerly 03.969)

Spring Quarter

Selected topics from the theory of finite automata, including such topics as machine experiments; information lossless machines; linear sequential machines; finite-state recognizers. *Prereq.: ECE 3447 or 3449.*

ECE 3451 Combinatorial Methods and Optimization Techniques (formerly 03.888) **4 Q.H.**

Winter Quarter

An introductory course in applied combinatorial mathematics which treats selected topics in enumerative analysis. Particular subjects include permutations, combinations, generating functions, recurrence relations, and the principle of inclusion and exclusion. Polya's theory of counting; selected topics in optimization techniques, which include transport networks, matching theory, linear programming, and an introduction to dynamic programming. *Prereq.: ECE 3200.*

ECE 3452 Combinatorial Methods and Optimization Techniques A (formerly 03.898) **2 Q.H.**

Winter Quarter

ECE 3452 and ECE 3453 cover the same material with the same prerequisites as ECE 3451, but in two 2 Q.H. courses.

ECE 3453 Combinatorial Methods and Optimization Techniques B (formerly 03.899) **2 Q.H.**

Spring Quarter

Continuation of ECE 3452. *Prereq.: ECE 3452.*

ECE 3454 Graph Theory **2 Q.H.**
(formerly 03.837)

Spring Quarter

Fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Selected applications of graph theory in such fields as network theory, switching theory, and computer science. *Prereq.: ECE 3211.*

ECE 3460 Special Topics in Computer Engineering (formerly 03.988) **2 Q.H.**

Spring Quarter

Aspects of computer engineering not covered in other courses. The subject matter may change from year to year.

ECE 3463 Robotic Sensors **4 Q.H.**
Winter Quarter

The main theme of this course is acquisition and processing of information for robot control. The subject is divided into two parts along the functional use of sensory information. Internal sensors, which monitor the state of the robot system (joint load, balance, kinesthesia, temperature, etc.) are analyzed first. The external sensors, which allow the system to interact with the environment are the second major topic of the course. These include proximity, rangefinding

and vision. Topics for study will be chosen from the following areas: low level vision, 3-D vision, real time image understanding, theory of shape, theory of motion, etc. The objective of the course is to analyze the pertinence of different sensory modalities to endow the next generation of robots with "intelligent" behavior. Students will be required to participate in the weekly research reviews. Each student will have to complete a design project by simulating relevant problems in LISP environment. *Prereq.: Permission of Instructor.*

ECE 3464 Robotic Sensors A **2 Q.H.**
Fall Quarter

ECE 3464 and ECE 3465 cover the same material with the same prerequisites as ECE 3463, but in two 2 Q.H. courses.

ECE 3465 Robotic Sensors B **2 Q.H.**
Winter Quarter

Continuation of ECE 3464. *Prereq.: ECE 3464.*

ECE 3466 Intelligent Robots **4 Q.H.**
(formerly 03.874)

Spring Quarter

The course focuses on studies of intelligent interactions between robots and their environments. An important issue is the implementation of a goal directed behavior with emphasis on sensory driven locomotion and manipulation. "Robot as an Intelligent Agent" is the general topic under which these concepts are introduced during the first three weeks of the course. The second major topic deals with attempts to constrain the problem of machine perception from an engineering point of view. Finally, the high level concepts such as learning, knowledge representation, adaptation and self-organization are discussed in the context of artificial intelligence. *Prereq.: ECE 3463.*

ECE 3467 Intelligent Robots A **2 Q.H.**
Winter Quarter

ECE 3467 and ECE 3468 cover the same material with the same prerequisites as ECE 3466, but in two 2 Q.H. courses.

ECE 3468 Intelligent Robots B **2 Q.H.**
Spring Quarter

Continuation of ECE 3467. *Prereq.: ECE 3467.*

ECE 3469 Fault-Tolerant Computers **4 Q.H.**
Winter Quarter

Concepts of computer systems structures and specifications; software and hardware interactions; failure and reliability; errors and faults. Study of different types of faults; fault prevention and fault tolerance; redundancy management; reliability and availability. Comparisons of existing fault-tolerant computer architectures such as SIFT, FTMP, Tandem 16, and Stratus/32. Techniques of error detection and error recovery. Mechanisms for damage confinement and damage assessment. Study of software fault tolerance techniques such as recovery block scheme, deadline mechanism, and N-version programming scheme. *Prereq.: ECE 3391.*

ECE 3470 Fault-Tolerant Computers A 2 Q.H.**Winter Quarter**

ECE 3470 and ECE 3471 cover the same material with the same prerequisites as ECE 3469, but in two 2 Q.H. courses.

ECE 3471 Fault-Tolerant Computers B 2 Q.H.**Spring Quarter**

Continuation of ECE 3470. *Prereq.: ECE 3470.*

ECE 3502 Special Topics in Digital 2 Q.H.**Signal Processing-Fast Algorithms
(formerly 03.8U4)****Fall Quarter**

Fast algorithms for implementation of digital filters and discrete Fourier transforms: FFT, convolution algorithm, Number Theoretic Transforms (NTT), filtering computation, and polynomial transforms. *Prereq.: ECE 3321.*

ECE 3503 Two-Dimensional Digital 2 Q.H.**Signal Processing (formerly 03.8U7)****Winter Quarter**

This course is concerned with two-dimensional digital signal processing which is finding wide applications in many diversified areas. Covers 2-D shift invariant systems along with their stability, the 2-D Discrete Fourier Transform (DFT) and its FFT implementation, and 2-D digital filter design and implementation. *Prereq.: ECE 3321.*

ECE 3505 Digital Image Processing 4 Q.H.**(formerly 03.9D3)****Spring Quarter**

Topics include: generation of digital image from the source, image digitizers and display devices, image transforms, enhancement techniques such as histogram, equalization, edge sharpening etc.; restoration by Wiener and Kalman filters, image coding using run length coding, DPCM, transform coding and feature analysis. *Prep: ECE 3321.*

ECE 3506 Digital Image Processing A 2 Q.H.**(formerly 03.9D1)****Fall Quarter**

ECE 3506 and ECE 3507 cover the same material with the same prerequisites as ECE 3505, but in two 2 Q.H. courses.

ECE 3507 Digital Image Processing B 2 Q.H.**(formerly 03.9D2)****Winter Quarter**

Continuation of ECE 3506. *Prereq.: ECE 3506.*

ECE 3508 Modern Spectral Analysis 4 Q.H.

Introduction; conventional methods of spectrum estimation: periodogram and autocorrelation methods with their smooth versions; the maximum likelihood method of Capon and its modifications; the maximum entropy method with and without uncertainty in the correlation measurements; the Levinson algorithm; the minimum energy method, weighted Burg techniques, forward-backward least-squares, covariance least-squares; moving average (MA) and ARMA spectrum estimation; model order selection criteria;

harmonic decomposition methods: Prony, Pisarenko, and singular value decomposition methods; introduction to multichannel random processes; multichannel conventional spectrum estimation techniques; parametric modeling of multichannel time series; the Levinson-Wiggins-Robinson algorithm; multichannel AR spectrum estimation techniques. *Prep. ECE 3321.*

ECE 3509 Modern Spectral Analysis A 2 Q.H.

ECE 3509 and 3510 cover the same material with the same prerequisites as ECE 3508, but in two 2 Q.H. courses. *Prereq.: ECE 3321.*

ECE 3510 Modern Spectral Analysis B 2 Q.H.

Continuation of ECE 3509. *Prereq.: ECE 3509.*

**ECE 3511 Data Communications Networks 4 Q.H.
(formerly 03.8F6)****Spring Quarter**

Elements of computer-communication networks; network topology and design; elements of protocols, routing and network control; queuing and congestion control; description and comparison of several existing computer networks. *Prereq.: ECE 3241.*

**ECE 3512 Data Communications Network A 2 Q.H.
(formerly 03.8F4)****Winter Quarter**

ECE 3512 and ECE 3513 cover the same material with the same prerequisites as ECE 3511, but in two 2 Q.H. courses.

ECE 3513 Data Communications Network B 2 Q.H.**(formerly 03.8F5)****Spring Quarter**

Continuation of ECE 3512. *Prereq.: ECE 3512.*

ECE 3514 Error Correcting Codes 4 Q.H.**(formerly 03.9A0)****Spring Quarter**

Error correcting codes and their decoding techniques which show promise for applications in digital communication, control and computer systems. Emphasis is placed on the linear block codes based on algebraic structures; cyclic codes for random error correction (B-C-H codes) and burst error correction. Convolutional codes and decoding including the Viterbi algorithm, arithmetic codes. Combination of codes. Coding for ranging and synchronization. *Prep. ECE 3211.*

ECE 3515 Error Correcting Codes A 2 Q.H.**(formerly 03.9A1)****Winter Quarter**

ECE 3515 and ECE 3516 cover the same material with the same prerequisites as ECE 3514, but in two 2 Q.H. courses.

ECE 3516 Error Correcting Codes B 2 Q.H.**(formerly 03.9A2)****Spring Quarter**

Continuation of ECE 3515. *Prereq.: ECE 3515.*

ECE 3517 Information Theory **2 Q.H.**
(formerly 03.903)

Spring Quarter

Deals principally with three aspects of information theory; the statistical description of sources and probabilistic measure of their information contents, the determination of channel capacity; and the fundamental coding theorems. *Prereq.: ECE 3241 and ECE 3351.*

ECE 3520 Special Topics in **2 Q.H.**
Communication Theory (formerly 03.908)

Spring Quarter

Current aspects of communication theory not covered in previous courses. Subject matter may change from year to year. *Prereq.: ECE 3241 and ECE 3351.*

ECE 3521 Multidimensional Spectrum **2 Q.H.**
Estimation

Introduction; stationary random fields and their spectrum representation; plane waves and their frequency-wavenumber spectrum; conventional methods (FFT based) and m-d window functions; m-d maximum likelihood method of Capon; 2-d maximum entropy methods; the extendibility problem in spectrum estimation; m-d parametric models for spectrum estimation: separable methods, m-d AR methods, techniques based on minimum variance representations, 2-d ARMA methods; the m-d Prony and Pisarenko methods. *Prereq.: ECE 3503, 3508.*

ECE 3522 Array Signal Processing **2 Q.H.**

Array Systems: configurations, cost, complexity, narrowband and wideband systems; problem formulation; duality between spectrum estimation and array processing; array processing methods: beamforming, minimum variance distortionless, autoregressive, thermal noise, music; coherent vs. incoherent sources; adaptive array processing: sidelobe cancellation, interference rejection, LMS algorithm; wideband array processing techniques; applications to sonar, radar, geophysics and biomedicine. *Prereq.: ECE 3321.*

ECE 3523 Communication Systems **4 Q.H.**
(formerly 03.870)

Fall Quarter

Primarily concerned with radio communication systems as used in terrestrial and space communication applications. Antenna gain, space loss, cosmic and atmospheric noise, and receiver noise are considered as factors influencing the signal-to-noise ratio in space and satellite repeater systems. Contemporary systems are discussed from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. The theoretical aspects of amplitude and angle modulation systems are introduced and extended to cover multiplex systems; signal-to-noise ratio analysis of frequency multiplex systems; time division multiplex systems. Coverage of digital systems will include sampling, aliasing, and PCM/ FM. Bit stream organization for transmission

will be considered. A PCM encoder will be discussed as a means of matching the bit stream to the bandwidth. Illustrative examples will be drawn from contemporary communications systems used on balloons, rockets, and satellite repeaters. *Prereq.: ECE 3241 and ECE 3104 or equivalent.*

ECE 3524 Communication Systems A **2 Q.H.**
(formerly 03.871)

Fall Quarter

ECE 3524 and ECE 3525 cover the same material with the same prerequisites as ECE 3523, but in two 2 Q.H. courses.

ECE 3525 Communication Systems B **2 Q.H.**
(formerly 03.872)

Winter Quarter

Continuation of ECE 3524. *Prereq.: ECE 3524.*

ECE 3527 Nonlinear Systems I **2 Q.H.**
(formerly 03.910)

Fall Quarter, As Announced

Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, or a transient. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series. *Prereq.: ECE 3241 and ECE 3221.*

ECE 3528 Nonlinear Systems II **2 Q.H.**
(formerly 03.911)

Winter Quarter, As Announced

Nonlinear systems with random inputs. Functional representation of the response of a nonlinear system when its input is a random process. Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria. *Prep. ECE 3527.*

ECE 3529 Nonlinear Systems III **2 Q.H.**
(formerly 03.912)

Spring Quarter, As Announced

Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. *Prereq.: ECE 3528.*

ECE 3530 Three-Dimensional Picture **2 Q.H.**
Processing (formerly 03.887)

Spring Quarter

The application of computer, optical, and analytic methods in abstracting geometrical information from pictures. Pictorial presentation of data trains into multidimensional pictures. Methods will be studied for reconstructing three-dimensional objects from two-dimensional pictures. Applications will be in the areas of X-ray analysis, radar target identification,

microscopy, and sensory perception. Students will have the chance to pursue individual projects during the term. *Prereq.: ECE 3321.*

ECE 3531 Adaptive Signal Processing 4 Q.H.
Introduction; Optimum filtering (Wiener-Kalman); Signal and system modeling using linear prediction; Adaptive filtering (FIR, IIR); Fast algorithms for Least Squares adaptive filters; Adaptive array processing; VLSI architectures for adaptive signal processing. *Prep: ECE 3321. Prereq.: ECE 3321.*

ECE 3532 Adaptive Signal Processing A 2 Q.H.
ECE 3532 and 3533 cover the same material with the same prerequisites as ECE 3531, but in two 2 Q.H. courses. *Prereq.: ECE 3321.*

ECE 3533 Adaptive Signal Processing B 2 Q.H.
Continuation of ECE 3532. *Prereq.: ECE 3532.*

ECE 3534 Digital Signal Processing of Speech Signals 4 Q.H.

This course emphasizes the analysis and recognition of speech using computer techniques. Introduction to speech physiology, linguistics, phonetics, and acoustics. Models of speech production. Short-term processing of speech—temporal features, Fourier analysis, applications. Theory of linear predictive coding and applications. Homomorphic analysis of speech and applications. Speech and speaker recognition. *Prep: ECE 3221.*

ECE 3535 Digital Processing of Speech Signals A 2 Q.H.
ECE 3535 and 3536 cover the same material with the same prerequisites as ECE 3534, but in two 2 Q.H. courses. *Prereq.: ECE 3321.*

ECE 3536 Digital Processing of Speech Signals B 2 Q.H.
Continuation of ECE 3535. *Prereq.: ECE 3535.*

ECE 3537 Multi-User Communication Systems 4 Q.H.
Contention-free multiple-access techniques: frequency-division multiple-access (FDMA), time-division multiple-access (TDMA). Spread-spectrum multiple-access (SSMA) communications: Direct-sequence SSMA, frequency-hop SSMA, and hybrid SSMA systems. Communication networks: queuing theory, multiple-access with contention (ALOHA random-access and tree algorithms for random-access), network routing and flow control (quasi-static control versus dynamic control). An overview of the applications of multi-user communication systems: computer-communication networks, broadcast satellite systems, military communications, mobile radio communications, packet-radio communication networks, and fiber-optic local-area networks. *Prep: ECE 3351.*

ECE 3538 Multi-User Communication Systems A 2 Q.H.
ECE 3538 and 3539 cover the same material with the same prerequisites as ECE 3537, but in two 2 Q.H. courses. *Prereq.: ECE 3351.*

ECE 3539 Multi-User Communication Systems B 2 Q.H.

Continuation of ECE 3538. *Prereq.: ECE 3538.*

ECE 3540 Digital Control Systems 4 Q.H.
(formerly 03.8D6)

Spring Quarter

Analysis of linear discrete-time dynamic systems; discretization of continuous systems; sampling and aliasing. Design of digital control systems using transform techniques by discrete equivalent and direct design methods; root locus, Bode and Nyquist diagrams and Nichols charts. Multivariant digital control using state-space methods; pole placement, observer, and regulator design. Controller implementation issues: digital filter realizations, nonlinear effects due to quantization, roundoff, deadband, limit cycles. Selection of the sampling rate. *Prereq.: ECE 3221 and ECE 3381.*

ECE 3541 Digital Control Systems A 2 Q.H.
(formerly 03.8D4)

Fall Quarter

ECE 3541 and ECE 3542 cover the same material with the same prerequisites as ECE 3540, but in two 2 Q.H. courses.

ECE 3542 Digital Control Systems B 2 Q.H.
(formerly 03.8D5)

Winter Quarter

Continuation of ECE 3541. *Prereq.: ECE 3541.*

ECE 3543 Stochastic Control Theory 4 Q.H.
(formerly 03.965)

Fall Quarter

State observer and function observer for deterministic systems; statistical estimation theory, maximum likelihood and mean square error criteria; Kalman filtering; quadratic Gaussian control problem; computer implementation. *Prep: ECE 3241 and 3371.*

ECE 3544 Stochastic Control Theory A 2 Q.H.
(formerly 03.963)

Fall Quarter

ECE 3544 and ECE 3545 cover the same material with the same prerequisites as ECE 3543, but in two 2 Q.H. courses.

ECE 3545 Stochastic Control Theory B 2 Q.H.
(formerly 03.964)

Winter Quarter

Continuation of ECE 3544. *Prereq.: ECE 3544.*

ECE 3560 Acoustics I 2 Q.H.
(formerly 03.817)

Fall Quarter

The wave theory of sound. Radiation, reflection, and transmission phenomena. Distributed system analogies, and sound measurements. *Prereq.: ECE 3341.*

ECE 3561 Acoustics II 2 Q.H.
(formerly 03.818)

Winter Quarter

Speech and hearing, microphones and loudspeakers, guided waves, room acoustics. Environmental acoustics. *Prereq.: ECE 3560.*

ECE 3562 Acoustics III **2 Q.H.**
(formerly 03.819)

Spring Quarter

Scattering and diffraction. Effects of viscosity and heat conduction. Finite amplitude and shock waves. Introduction to underwater sound. *Prereq.: ECE 3561.*

ECE 3564 Radar Systems I **2 Q.H.**
(formerly 03.865)

Fall Quarter

Emphasis on the systems aspects of radar engineering. Topics covered include basic theory of radar detection, measurement of range, angle, and Doppler shift; classes of radar systems; types of radar noise; components of a radar system; matched filters and correlation receivers as applied to radar systems; fundamental ideas of radar system analysis. *Prereq.: ECE 3241.*

ECE 3565 Radar Systems II **2 Q.H.**
(formerly 03.866)

Winter Quarter

In-depth study of search radar theory; maximum likelihood estimation approach to measurement of radar target parameters; resolution and ambiguity functions applied to radar; radar parameter uncertainty principles. *Prereq.: ECE 3564.*

ECE 3566 Radar Systems III **2 Q.H.**
(formerly 03.867)

Spring Quarter

Advanced topics in radar systems engineering. Topics to be covered include: design considerations for multistatic radar systems, synthetic aperture radars; tracking systems; radar waveform synthesis; multi-function array radar techniques and selected topics in radar sensing techniques and devices. *Prereq.: ECE 3565.*

ECE 3572 Fourier Optics I **2 Q.H.**
(formerly 03.916)

Winter Quarter

This two-quarter sequence covers: optical diffraction and imaging problems as linear systems; necessary tools of Fourier analysis and linear systems analysis which occur when solving the scalar wave equation; waves and their properties; reflection, refraction, polarization, and propagation of waves; foundations of scalar diffraction theory—including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. *Prereq.: ECE 3581.*

ECE 3573 Fourier Optics II **2 Q.H.**
(formerly 03.917)

Spring Quarter

Continuation of ECE 3572. *Prereq.: ECE 3572.*

ECE 3574 Fourier Optics III **2 Q.H.**
(formerly 03.983)

Fall Quarter

This course covers current topics of interest in Fourier optics and optical instrumentation. Application of coherence phenomena to optical instrumentation such as microdensitometers, microscopes, viewers, cameras, spectrophotometric and interferometric instruments; applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics and medical application of laser optics. *Prereq.: ECE 3573.*

ECE 3576 Lasers I **2 Q.H.**
(formerly 03.806)

Fall Quarter

Review of basic optical principles and atomic physics; introduction to optical coherence; models for the interaction of electromagnetic radiation with matter; a general description of lasers is given. *Prereq.: ECE 3341.*

ECE 3577 Lasers II **2 Q.H.**
(formerly 03.807)

Winter Quarter

Laser threshold and rate equations; elementary resonator theory and fabrication; giant pulse operation; specific solid-state, liquid, and gas lasers; and laser systems. *Prereq.: ECE 3576.*

ECE 3578 Lasers III **2 Q.H.**
(formerly 03.808)

Spring Quarter

Applications of lasers and laser systems for a variety of engineering and basic science disciplines; specific laser optoelectronic devices. *Prereq.: ECE 3577.*

ECE 3579 Optoelectronics and Fiber Optics **2 Q.H.**

This course presents an overview and analysis of the various elements and their characteristics which are utilized in optical communication systems. These include elements which generate, transfer, and detect optical signals. Topics include resonance and guiding phenomena, semiconductor physics, LED's, lasers, diode detectors, optical waveguide theory and design, optical communication systems criteria. *Prereq.: ECE 3580.*

ECE 3580 Electro-Optics I **2 Q.H.**
(formerly 03.914)

Spring Quarter

Survey of the basic concepts necessary for understanding and evaluating the optics involved in electro-optical systems. The optical system as a linear system; matrix methods; diffraction and interference; imaging and aberrations. *Prereq.: Bachelor of Science Degree in Engineering or Physics.*

ECE 3581 Electro-Optics II 2 Q.H.
(formerly 03.915)

Fall Quarter

Survey of the basic concepts necessary for understanding electro-optical devices. Wave propagation in isotropic and non-isotropic media; optics of crystals; polarization; optical resonators; guided waves; modulators and detectors; thin-film optics. *Prereq.: ECE 3580.*

ECE 3583 Optical Properties of Matter I 2 Q.H.
(formerly 03.921)

Fall Quarter

Optics of crystals; classification and effects of crystal symmetry on optical properties; classical description of wave propagation in crystals; applications of the theory to modulation, pulse generation, nonlinear optics. *Prereq.: Bachelor of Science Degree in Engineering or Physics.*

ECE 3584 Optical Properties of Matter II 2 Q.H.
(formerly 03.922)

Winter Quarter

Introduction to electro-optical and magneto-optical effects in material media; linear and nonlinear optical materials; elasto-optic and acousto-optical materials; polarization and propagation effects; modulation. *Prereq.: ECE 3583.*

ECE 3585 Optical Properties of Matter III 2 Q.H.
(formerly 03.923)

Spring Quarter

Thin films and optical fibers; multilayer filters; dichroics; integrated optics. *Prereq.: ECE 3584.*

ECE 3587 Principles of Optical Detection I 2 Q.H.
(formerly 03.981)

Winter Quarter

Laws governing radiation and radiometry; properties of real radiation sources; detailed description of detection devices (image forming and signal generating); noise; contrast and MTF; detection systems (imaging devices and ranging devices); electro-optical detector systems analysis. *Prereq.: Bachelor of Science Degree in Engineering or Physics.*

ECE 3588 Principles of Optical Detection II 2 Q.H.
(formerly 03.982)

Spring Quarter

Review of detector parameters; statistics of detector noise; practical considerations in real detectors; detection, resolution and recognition of signals; heterodyne detection and parametric amplification; sub-nanosecond pulse detection calibration of electro-optical detectors; detectors as system components. *Prereq.: ECE 3587.*

ECE 3589 Optical Storage and Display 2 Q.H.
(formerly 03.913)

Spring Quarter

Survey of materials and methods for the storage and display of information. Topics included are: photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical

crystals, evaporated thin films and liquid crystals. *Prereq.: Bachelor of Science in Engineering or Physics.*

ECE 3590 Optical Instrumentation Design 2 Q.H.
(formerly 03.980)

Fall Quarter

An introduction to the design of optical instrumentation. Principles and basic concepts of optical systems. In sequence the topics are: introduction, mechanical shock and vibration, kinematic designs; application of third-order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, industrial design, examples and exercises. *Prereq.: Bachelor of Science in Engineering or Physics.*

ECE 3591 Spectroscopic Instrumentation 2 Q.H.
(formerly 03.984)

Winter Quarter

Survey of optical instrumentation employed in analysis and control situations; modern methods of spectrometry and interferometry; optimization of analytical systems; topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prereq.: ECE 3581.*

ECE 3592 Remote Sensing 2 Q.H.
(formerly 03.886)

Spring Quarter, As Announced

Electromagnetic fundamentals related to passive and active remote sensing of the earth. Geophysical exploration techniques. Radar fundamentals and radar scattering. Instrumentation and data processing. *Prep.: ECE 3341.*

ECE 3593 Plasma Engineering 4 Q.H.
(formerly 03.800)

Fall Quarter, As Announced

The goal of this course is to give an overview on the basic principles and applications of plasma and gaseous discharges. The topics include gas kinetics, interaction of electrons and ions with static and rf fields as well as wave propagation in plasmas. Applications in material processing, space exploration and microwave devices will also be discussed. *Prep.: ECE 3341.*

ECE 3594 Plasma Theory 4 Q.H.
(formerly 03.803)

Winter Quarter, As Announced

Introduction to the basic theory of gaseous discharges. Fluid and kinetic description of collisionless and collisional plasmas with and without magnetic field effects. Emphasis will be placed on linear stability analysis although nonlinear effects will also be discussed. *Prep.: ECE 3341.*

ECE 3595 Plasma Theory A 2 Q.H.
(formerly 03.801)

Winter Quarter, As Announced

ECE 3595 and ECE 3596 cover the same material with the same prerequisites as ECE 3594, but in two 2 Q.H. courses.

ECE 3596 Plasma Theory B **2 Q.H.**
(formerly 03.802)

Spring Quarter, As Announced

Continuation of ECE 3595. *Prereq.: ECE 3595.*

ECE 3600 Microwave Properties of Materials **4 Q.H.**

This course covers the following topics of interest at high frequencies: General Dielectric and Magnetic Properties of Materials; Tensor Properties of dielectric and Magnetic materials; Special microwave properties of thin film materials; Experimental techniques developed in the characterization of microwave materials. *Prep: ECE 3102 and ME 1386 or equivalent.*

ECE 3601 Microwave Properties of Materials A **2 Q.H.**

ECE 3601 and 3602 cover the same material with the same prerequisites as ECE 3600, but in two 2 Q.H. courses. *Prereq.: ECE 3102 or ME 1386 or equivalent.*

ECE 3602 Microwave Properties of Materials B **2 Q.H.**

Continuation of ECE 3601. *Prereq.: ECE 3601.*

ECE 3603 Propagation in Artificial Structures **4 Q.H.**

This course covers the following topics of interest: Effective dielectric and permeability constants in composite materials at high frequencies; Electromagnetic wave propagation in electrical and magnetic anisotropic media; Magnetostatic and Magneto-elastic wave propagation in single layer; Electromagnetic wave propagation in multi-layers. *Prereq.: ECE 3102 or equivalent.*

ECE 3604 Propagation in Artificial Structures A **2 Q.H.**

ECE 3604 and 3605 cover the same material with the same prerequisites as ECE 3603, but in two 2 Q.H. courses. *Prereq.: ECE 3102 or equivalent.*

ECE 3605 Propagation in Artificial Structures B **2 Q.H.**

Continuation of ECE 3604. *Prereq.: ECE 3604.*

ECE 3606 Applications of Plasma Engineering **4 Q.H.**

This course will cover basic operational principles of microwave electron devices, the theory of electric domain formation, free electron and gaseous lasers, particle beam accelerators and radiation sources. Particular topics include both classical microwave devices such as magnetrons, gyrotrons and crossed-field amplifiers, and solid-state devices such as Gunn diodes and Impatt diodes. *Prep: ECE 3593.*

ECE 3607 Applications of Plasma Engineering A **2 Q.H.**

ECE 3607 and 3608 cover the same material with the same prerequisites as ECE 3606, but in two 2 Q.H. courses. *Prereq.: ECE 3593.*

ECE 3608 Applications of Plasma Engineering B **2 Q.H.**

Continuation of ECE 3607. *Prereq.: ECE 3607.*

ECE 3610 Electronics of Analog Signal Processing (formerly 03.8E3) **4 Q.H.**

Spring Quarter, As Announced

Analog signal acquisition and processing utilizing state of the art devices and circuit techniques such as adaptive filters in sampled data systems, CZTs for spectral analysis, correlated double sampling for improved S/N ratios and solid-state imaging systems. Linear and nonlinear processing with MOS, bipolar and CTDs such as CCDs and SAWs. Attention given to analog vs. digital approaches for implementation of similar applications, i.e., bandwidth requirements, throughput, accuracy, cost, etc. *Prereq.: ECE 3331 and ECE 3384.*

ECE 3611 Electronics of Analog Signal Processing A (formerly 03.8E1) **2 Q.H.**

Fall Quarter, As Announced

ECE 3611 and ECE 3612 cover the same material with the same prerequisites as ECE 3610, but in two 2 Q.H. courses.

ECE 3612 Electronics of Analog Signal Processing B (formerly 03.8E2) **2 Q.H.**

Winter Quarter, As Announced

Continuation of ECE 3611. *Prereq.: ECE 3611.*

ECE 3613 UHF and Microwave Devices **4 Q.H.**
Spring Quarter, As Announced

Transferred electron devices, parametric devices, microwave transistors such as HEMT's and HBJT's. Equivalent circuit representation using S parameters. Computer-aided design and modelling of devices. Noise characteristics at microwave frequencies. Microwave integrated circuits. *Prereq.: ECE 3341 and ECE 3384.*

ECE 3614 UHF and Microwave Devices A and Systems A (formerly 03.8H1) **2 Q.H.**

Fall Quarter

ECE 3614 and ECE 3615 cover the same material with the same prerequisites as ECE 3613, but in two 2 Q.H. courses.

ECE 3615 UHF and Microwave Devices B and Systems B (formerly 03.8H3) **2 Q.H.**

Winter Quarter

Continuation of ECE 3614. *Prereq.: ECE 3614.*

ECE 3616 Active Network Synthesis and Design **4 Q.H.**

Multiloop feedback techniques are developed and applied to integrated circuit designs such as three-stage Op-Amp realizations and minimum sensitivity amplifiers. Application of these circuits in continuous-time and switched capacitor filters are treated. Single-active biquadratic filter sections of Sallen and Key and Friend-Delyannis are developed. Multiloop and multiple-active element realizations such as the generalized impedance converter (GIC), frequency-dependent negative resistance (FDNR), follow-the-leader (FLF) and leap-frog (LF) structures are discussed. Design considerations include sensitivity, yield factors, gain-bandwidth product and the

logic, are covered. Memory cells and basic cells in logic arrays are treated. Design considerations include propagation delay, switching speed, fan-out and the effect of parasitics. Design techniques are correlated with computer simulations. *Prereq.: ECE 3101 or equivalent.*

ECE 3633 Design and Analysis of Digital Integrated Circuits A 2 Q.H.

ECE 3633 and 3634 cover the same material with the same prerequisites as ECE 3632, but in two 2 Q.H. courses. *Prereq.: ECE 3101 or equivalent.*

ECE 3634 Design and Analysis of Digital Integrated Circuits B 2 Q.H.

Continuation of ECE 3633. *Prereq.: ECE 3633.*

ECE 3635 Antennas and Radiation 4 Q.H.

Integral equation for the current in the linear antenna; methods of solution; the loop antenna, linear antenna arrays; aperture antennas and lenses; slot antennas and phased arrays; numerical methods in antenna analysis. *Prereq.: ECE 3341.*

ECE 3636 Antennas and Radiation A 2 Q.H.

ECE 3636 and 3637 cover the same material with the same prerequisites as ECE 3635, but in two 2 Q.H. courses. *Prereq.: ECE 3341.*

ECE 3637 Antennas and Radiation B 2 Q.H.

Continuation of ECE 3636. *Prereq.: ECE 3636.*

ECE 3646 Multivariable Control Systems 4 Q.H.

Mathematical preliminaries, polynomial and polynomial matrices: representations of linear multivariable systems; matrix fraction description (MFD) and polynomial matrix description (PMD); responses of linear multivariable systems; controllability, observability and canonical forms; poles and zeros of multivariable systems; stability; realization problem; interaction control; state feedback and observer design; compensator design, stability and robustness; noninteraction control; frequency domain design techniques. *Prep: ECE 3221, ECE 3381.*

ECE 3647 Multivariable Control Systems A 2 Q.H.

ECE 3647 and 3648 cover the same material with the same prerequisites as ECE 3646, but in two 2 Q.H. courses. *Prereq.: ECE 3381.*

ECE 3648 Multivariable Control Systems B 2 Q.H.

Continuation of ECE 3647. *Prereq.: ECE 3647.*

ECE 3797 Engineer Degree Continuation 0 Q.H. (formerly 03.923)

Any Quarter

Candidates to sign up for thesis continuation if their thesis is not completed after they have registered for 3 consecutive quarters or 10 Q.H. of EE degree thesis. Continuous registration is required until the candidate graduates.

ECE 3798 Master's Thesis Continuation 0 Q.H. (formerly 03.9X1)

Any Quarter

ECE 3799 PhD Continuation (formerly 03.9X4)

Any Quarter

0 Q.H.

ECE 3860 Master's Thesis (formerly 03.995)

Any Quarter

8 Q.H.

Analytical and/or experimental work conducted under the auspices of the department. *Prereq.: Bachelor of Science degree in Engineering or Science.*

ECE 3861 Master's Thesis Any Quarter

4 Q.H.

ECE 3862 Master's Thesis Any Quarter

2 Q.H.

ECE 3870 Engineer Degree Thesis (formerly 03.9Z2)

Any Quarter

4 or 8 Q.H.

Analytical and/or experimental work conducted under the auspices of the department. Minimum of 4 Q.H., maximum of 8 Q.H. allowed per quarter. *Prereq.: Admission to Engineer Degree Program.*

ECE 3871 Engineer Degree Thesis Any Quarter

4 Q.H.

ECE 3872 Engineer Degree Thesis Any Quarter

2 Q.H.

ECE 3880 Doctoral Thesis (formerly 03.996)

Any Quarter

0 Q.H.

Theoretical and/or experimental work conducted under the auspices of the department. *Prereq.: Passing of PhD Qualifying Exam.*

ECE 3887 Master's Seminar I (formerly 03.990)

Any Quarter

2 Q.H.

A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lectures. *Prereq.: Bachelor of Science degree in Engineering or Science.*

ECE 3888 Master's Seminar II (formerly 03.991)

Any Quarter

2 Q.H.

The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. *Prereq.: ECE 3887.*

ECE 3889 Doctoral Seminar (formerly 03.993)

Any Quarter

0 Q.H.

This requirement will be satisfied by the student presenting a seminar to the Electrical Engineering Department on a subject related to his/her PhD thesis. The thesis supervisor will coordinate the seminar. *Prereq.: Passing of PhD Qualifying Exam.*

ECE 3892 Doctoral Reading 2 Q.H.
(formerly 03.997)
Any Quarter
Material approved by the candidate's adviser. (Only S or F grades will be assigned for this course.)
Prereq.: Passing of PhD Qualifying Exam.

ECE 3893 Special Problems in Electrical Engineering (formerly 03.998) 2 Q.H.
Any Quarter
Theoretical or experimental work under individual faculty supervision. *Prereq.: Consent of Department Chairman.*

ECE 3894 Engineer Degree Reading (formerly 03.9Z1)
To be taken upon completion of 30 Q.H. of satisfactory course work. *No credits toward course requirements are given.* Minimum of 4 Q.H., maximum of 8 Q.H. allowed per quarter.

ECE 3895 Engineer Degree Reading 8 Q.H.
Any Quarter

ECE 3896 Special Problems in Electrical Engineering 4 Q.H.
Any Quarter

Biomedical

INT 3250 Engineering and Medicine I 2 Q.H.
(formerly 93.901)
Fall Quarter

The intersection of technology with medicine; historical development of bioengineering profession; its impact on society; study of activities embraced by the profession today; educational, training, and career opportunities in clinical, biomedical, and medical engineering for individuals at the BS, MS, and PhD levels; future goals of engineering in biology and medicine; and issues basic to the relationship between new medical technology and the efficiency and effectiveness of the health care system. *Prereq.: Bachelor of Science in Engineering or allied field.*

INT 3251 Biomedical Applications of Heat and Mass Transfer (formerly 93.911) 2 Q.H.
Winter Quarter

Bioheat equation; thermal transport in living systems, thermal properties; thermal techniques in the

measurement of blood flow; applications of heat transfer in medicine including hyperthermia for cancer therapy, hypothermia for tissue and organ preservation and cryosurgery, thermal sources for implantable artificial heart; and thermography in cancer detection. *Prereq.: Bachelor of Science in Engineering or allied field.*

INT 3252 Selected Topics in Bioengineering (formerly 93.912) 2 Q.H.
Spring Quarter

Study of biomedical engineering appropriate to topics selected from fields of biomaterials, nuclear medicine, radiation diagnosis and therapy, biological transport processes, artificial organs, rehabilitation engineering, and microprocessor based clinical instruments. Introduction to medical technology assessment. *Prereq.: INT 3250 or permission of instructor.*

Industrial Engineering

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time.

IIS 3101 Industrial Accounting for Engineers (formerly 05.810) 2 Q.H.
Fall, Winter and Spring Quarters

Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical covering of basic cost accounting procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems.

IIS 3102 Introduction to Human Factors Engineering (formerly 05.851) 2 Q.H.
Fall and Winter Quarters

A survey of the principal topics and areas of concentration in the field. Includes introductory concepts of sensory physiology and sensory performance; basic motor capabilities and limitations; concepts of the human as a processor of information; and methods of gathering human performance data. Normally the first course in the human factors areas for students without behavioral science background. *Prereq.: IIS 3113 or permission of instructor.*

IIS 3103 Basic Operations Research 4 Q.H.
(formerly 05.900)**Winter and Spring Quarters**

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines, and Markov Chains. *Prereq.: IIS 3113.*

IIS 3106 Elements of Structured 2 Q.H.
Programming (formerly 05.920)**Fall, Winter and Spring Quarters**

An introductory course to the principles and techniques of top down structured programming. The host language is PASCAL and topics covered include assignment statements, logical expressions, control statements, data structures, recursion and pointers. *Prereq.: Admission to Graduate Program.*

IIS 3111 Principles of COBOL 2 Q.H.
(formerly 05.939)**Fall and Winter Quarters**

Fundamentals of computer programming in COBOL. Topics include elementary computer functioning, program organization, input/output operations, arithmetic and data-handling verbs, and program logic development through the use of flow charts. Storage and manipulation of large data files on magnetic tape are introduced. No prior computer experience is required. *Prereq.: Admission to Graduate Program.*

IIS 3112 Quantitative Methods for 4 Q.H.
Information Systems**Fall and Winter Quarters**

An introduction to the theory and use of deterministic and stochastic models in the context of computer and information systems. Models included are linear programming, dynamic programming, Monte Carlo simulation, Gant and Pert charts, multicriteria decision analysis and waiting lines. Class examples will emphasize applications in a computer and information systems environment. *Prereq.: Admission to Graduate Program.*

IIS 3113 Basic Probability and Statistics 4 Q.H.
Fall, Winter and Spring Quarters

Fundamental concepts of probability. Events, sample space, discrete and continuous random variables. Density functions, mass functions, cumulative probability distributions, and moments generating functions. Expectation of random variables. Common discrete and continuous probability distributions including binomial, poisson, geometric, uniform, exponential, and normal. Multivariate probability distributions, covariance and independence of random variables. Sampling and descriptive statistics. Parameter estimation, confidence intervals, and hypothesis testing. *Prereq.: Admission to Graduate Program.*

IIS 3114 Industrial Engineering Economy 4 Q.H.
Fall and Spring Quarters

Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical covering of basic cost accounting

procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems. Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate-of-return techniques using discrete compound interest calculations. *Prereq.: Admission to Graduate Program.*

IIS 3115 Modula-2 for Engineers 4 Q.H.
Fall Quarter

The objectives of the course include: methods for solving problems on the computer, knowledge of the basic hardware/software of a computer system and proficiency in a high level programming language (Modula-2). The building blocks of Modula-2: data types, variable and constant declarations; enumerations, arrays, sets, records, and pointers; input/output library functions. The control structures of Modula-2: procedures, modules and visibility control. Also covered are sequential and screen-oriented input/output; recursion, concurrency and low-level facilities; software design using structured charts. *Prep.: Admission to Graduate Program.*

IIS 3116 Assembly Language 4 Q.H.
Fall Quarter

The study of microcomputer programming in assembly language with emphasis on structured programming techniques, interrupts and input/output devices. Microprocessor programming model, instruction set and addressing modes. Microcomputer system architecture, system resources, interrupt processing, input/output interfaces. Students will use an assembler and debugger on the IBM-PC. The 8088 instruction set will be studied in connection with making interrupt calls to the IBM-DOS. Exercises in data transfer, graphics and music programs. A macro assembler will be used to write programs. *Prep. Higher level language.*

IIS 3117 Intensive Modula-2 2 Q.H.
Winter Quarter

Programming in Modula-2 for students who know another structured high-level language. Syntax and basic data and control structures: modules, procedures and visibility control; and overview of enumerations, arrays, records, sets and pointers. Basic input/output library functions; sequential and screen-oriented input/output. Recursion, concurrency and low-level facilities in Modula-2. Software design using structured charts

IIS 3200 Organizational Perspectives and 4 Q.H.
Project Management
Spring Quarter

A survey of business organization, management and operation, including business responsibility to its employees, its product, the customer and the environment in which it operates. Planning, forecasting, and budgeting; the financial markets; investing and speculating will be covered, as well as the interaction of politics, government and government controls on the

industrial enterprise. *Prereq.: Admission to Graduate Program.*

IIS 3201 Analysis of the Industrial Enterprise I **2 Q.H.**
Fall Quarter

IIS 3201 and IIS 3202 cover the same material as IIS 3200, but in two 2 Q.H. courses.

IIS 3202 Analysis of the Industrial Enterprise II **2 Q.H.**
Winter Quarter

IIS 3201 and IIS 3202 cover the same material as IIS 3200, but in two 2 Q.H. courses. *Prep. IIS 3201.*

IIS 3204 Engineering/Organizational Psychology **4 Q.H.**
Fall Quarter

An analysis of the purpose and functioning of organizations as the basic networks for achieving goals through coordination of effort, communication, and responsibility. The approach will emphasize the role and function of engineering organizations and will be based on modern behavioral science concepts. The course covers the application of psychology to industry relative to human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. *Prereq.: Admission to Graduate Program.*

IIS 3205 Industrial Organizations **2 Q.H.**
Winter Quarter

IIS 3205 and IIS 3206 cover the same material as IIS 3204, but in two 2 Q.H. courses.

IIS 3206 Industrial Psychology for Engineers **2 Q.H.**
Spring Quarter

IIS 3205 and IIS 3206 cover the same material as IIS 3204, but in two 2 Q.H. courses. *Prep. IIS 3205.*

IIS 3207 Financial Management **4 Q.H.**
Fall and Winter Quarters

Study of the issues and processes of short-term financing on industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. Also covered is the analysis necessary for such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prereq.: IIS 3101 or IIS 3114 and IIS 3201 or equivalent.*

IIS 3208 Financial Management I **2 Q.H.**
Fall Quarter

IIS 3208 and IIS 3209 cover the same material, with the same prerequisites, as IIS 3207, but in two 2 Q.H. courses.

IIS 3209 Financial Management II **2 Q.H.**
Winter Quarter

IIS 3208 and IIS 3209 cover the same material as IIS 3207, but in two 2 Q.H. courses. *Prep. 3208.*

IIS 3214 Engineering Communications **2 Q.H.**
(formerly 05.813)

Spring Quarter

Exploration of practice in the preparation and presentation, both written and oral, of the results of engineering projects and programs as a basis for business decisions; including formal reports, progress summaries, memoranda, and technical papers. The effective use of various media and audiovisual aids based on both audience and material. *Prereq.: Admission to Graduate Program.*

IIS 3216 Advanced Engineering Economy **2 Q.H.**
(formerly 05.809)

Winter Quarter

Principal emphasis on the practical application of the techniques studied in basic engineering economy; problems of implementation through class discussion of cases and student projects; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prereq.: IIS 3114.*

IIS 3217 Engineering Project Management **4 Q.H.**
Winter and Spring Quarters

The optimization of schedules utilizing pertinent software tools such as the linear programming and project management packages will be undertaken. Other graphics software used to draw project diagrams such as Gantt charts, PERT diagrams, manpower loading charts, and funding charts will be included. Determination of the critical path and comparison of actual performance with the planned schedule will be covered. The systems life cycle will be considered. Needs analysis, requirements definition, preliminary design, detailed design, and implementation will be addressed in the context of project management.

IIS 3218 Planning and Managing Information Systems Development **4 Q.H.**

Spring Quarter

The computer system development life cycle. Interactions between the system and the organization. Design parameters and tradeoffs. Planning for externalities. Individual and organizational aspects of human decision making. Systems approach to planning, management and control of effective information systems development. The course will be based on extensive use of case studies and will include some guest speakers. IIS 3621 and IIS 3617 cover the same material as IIS 3218, but in two 2 Q.H. courses. *Prep. IIS 3615.*

IIS 3219 Cost Accounting and Industrial Budgeting **4 Q.H.**

Fall and Spring Quarters

Cost accounting procedures are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals and for input into various budgeting plans which the engineer may become involved with. An introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash,

capital, and cost-volume profit analysis will be provided. *Prereq.: IIS 3114.*

IIS 3220 Development of Engineering Personnel 4 Q.H.
Fall Quarter

The science and art of managing creative people employed in research, developmental, and engineering activities are considered with a view to understanding the problems encountered by such people and their managers in the course of their professional work. Attention is devoted to such behavioral theories and their applications in the practice of management. Emphasis is placed on each student's experiences as professionals or managers in diverse industrial settings. *Prereq.: Admission to Graduate Program.*

IIS 3302 Advanced Work Design 2 Q.H.
(formerly 05.817)

Spring Quarter

Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models; repetitive and nonrepetitive work models, and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches; emphasis on development of professional, analytical, and managerial skills and abilities at a systems level. *Prereq.: Bachelor of Science degree in Engineering or Science.*

IIS 3303 Product Design and Value Analysis 2 Q.H.
(formerly 05.822)

Winter Quarter

Study of design parameters and their effect on development, manufacturing and procurement; functional analysis of components and systems; complete projects and case studies are integrated in the course. *Prereq.: Bachelor of Science degree in Engineering or Science.*

IIS 3304 Production Analysis 4 Q.H.
(formerly 05.823)

Fall Quarter

Modern quantitative techniques of production planning and control considering deterministic and probabilistic models are presented. Topics include project planning, forecasting, aggregate planning and master scheduling, inventory analysis and control, materials requirement planning, job shop scheduling and dispatching problems. *Prep. IIS 3103 and IIS 3113.*

IIS 3305 Case Studies in Industrial Engineering 2 Q.H.
(formerly 05.824)

Spring Quarter

Formulation of problems and analysis of situations on topics such as work measurement, line balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Class discussion and written

analysis of a variety of cases are included. *Prereq.: IIS 3304.*

IIS 3306 Network Planning and Control 2 Q.H.
(formerly 05.912)

Spring Quarter

Applications of stochastic networks to project management, scheduling, inventory, reliability, quality control and other industrial applications; review of PERT and its inadequacies, to the development of stochastic flow-graphs and networks; solving for the mean task times and variances using moment-generating functions; setting up the model for computer simulation using GERT. *Prereq.: IIS 3506 or IIS 3523.*

IIS 3307 Introduction to Microprocessors 2 Q.H.
(formerly 05.971)

Winter Quarter

First course in advanced microprocessor systems introducing basic concepts of system architecture, interfaces and programming using modern 16- and 32-bit microprocessor families. CPU programming model, instruction set, addressing modes and exception processing. Privilege states, memory management, bus control. Principles of assembly language programming. Two microprocessor families: MC68000 and iAPX 86. *Prep. Structured higher level language.*

IIS 3308 Microcomputer Applications 2 Q.H.
(formerly 05.972)

Spring Quarter

Introductory course on microcomputer applications in local networks. Multi-microcomputer systems, bus topology interconnection, communication architecture and protocols. Microcomputer-based local network nodes, local network model and protocol development examples. Token bus and collision detection protocols. *Prep. Structured higher level language and IIS 3307 or equivalent.*

IIS 3309 Computer Methods in Manufacturing 4 Q.H.
(formerly 05.974)

Fall Quarter

In-depth coverage of the use of computers in selected areas of manufacturing systems design is presented. Possible topic areas are numerical control, MRP, process planning and control, and other important applications of computers to manufacturing systems. *Prereq.: IIS 3311 or permission.*

IIS 3310 Manufacturing Methods and Processes 4 Q.H.
(formerly 05.975)

Spring Quarter

Material covered includes the structures of polymers (thermoplastic, thermosetting and glasses). Manufacturing processes for polymers including thermoforming are included. Structure of metals, the manufacturing processes for metal forming are presented. Alloys and welding and brazing are also included. *Prereq.: Bachelor of Science degree in Engineering or Science.*

IIS 3311 Computer-Aided Manufacturing 4 Q.H.
(formerly 05.980)**Spring Quarter**

A first course (overview) of computer aided-manufacturing. Covers the areas that encompass the term CAM: group technology, material requirements planning, part coding and classification, numerical control, part programming and management systems. Broad coverage of each of the areas is given to allow the student to gain an appreciation of the automated factory. *Prereq.: Compiler level language.*

IIS 3312 Forecasting and Inventory Control 4 Q.H.**Winter Quarter**

Econometric methods of forecasting the demand for industrial products; emphasis on techniques applicable to individual companies and the total demand. The principal tool used is the mathematical model of the causal factors with special attention to determining the reliability of the model. The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models and techniques, production planning, and control models and methods. *Prereq.: IIS 3523.*

IIS 3400 Human Factors Engineering 4 Q.H.**Winter Quarter**

The course covers sensory motor and work environment considerations. Topics include the design of equipment and systems for human use, with the application of engineering psychology; visual and auditory presentation of information; human information processing and skilled task performance. The course examines the human as a work-performing, heat-generating physiological engine, and the implied restrictions on the equipment and workplace to provide occupational safety and effective man/ machine performance. *Prereq.: IIS 3102.*

IIS 3401 Human Factors—Sensory Motor 2 Q.H.**Winter Quarter**

IIS 3401 and IIS 3402 cover the same material, with the same prerequisites, as IIS 3400, but in two 2 Q.H. courses.

IIS 3402 Human Factors—Work Environment 2 Q.H.**Spring Quarter**

IIS 3401 and IIS 3402 cover the same material as IIS 3400, but in two 2 Q.H. courses.

IIS 3403 Occupational Health and Safety 4 Q.H.**Winter Quarter**

Topics include safety responsibilities of management and employees; recognition of chemical, electrical, and mechanical hazards; principles of machine guarding; accident investigation and cost analysis; record keeping requirements under OSHA Act of 1970; safety programs and inspections; safety training; toxicology, first aid and medical services; fire prevention and control methods; occupational diseases and personnel protective equipment. *Prereq.: Admission to Graduate Program.*

IIS 3404 Introduction to Occupational Health and Safety 2 Q.H.**Winter Quarter****IIS 3405 Technical Aspects of Health and Safety 2 Q.H.**

IIS 3404 and IIS 3405 cover the same material as IIS 3403, but in two 2 Q.H. courses.

IIS 3406 Man-Computer Interaction 2 Q.H.
(formerly 05.853)**Spring Quarter**

Design and evaluation of the man-computer interface in on-line information systems; formatting of visual displays and auditory outputs, techniques to facilitate operator inputs, pacing and control of the interactive sequence, operator training, task analysis and performance testing. Student projects in areas of novel application. *Prereq.: IIS 3401.*

IIS 3407 Human Factors Engineering—Data Base 2 Q.H.**Winter Quarter**

IIS 3407 and IIS 3408 cover the same material, with the same prerequisites, as IIS 3410, but in two 2 Q.H. courses.

IIS 3408 Human Factors Engineering—Application Methods 2 Q.H.
(formerly 05.855)**Spring Quarter**

IIS 3407 and IIS 3408 cover the same material as IIS 3410, but in two 2 Q.H. courses. *Prep. IIS 3102.*

IIS 3409 Topics in Physiology and Biomedical Engineering (formerly 05.864) 2 Q.H.**Spring Quarter**

Introduction to specific areas relating to human structure and function, and to the use of engineering techniques for medical diagnosis and therapy. Areas considered include blood and blood components, the cardiovascular system, the kidney and urinary systems and respiratory systems. The course will be taught on a seminar basis. Students will be required to do literature research under the guidance of the instructor. *Prereq.: Permission of instructor.*

IIS 3410 Advanced Human Factors Engineering 4 Q.H.**Winter Quarter**

The study of methods and techniques used to obtain and interpret human performance data. Includes examination of experimental methods and problems peculiar to experimentation with human subjects; unobtrusive measures, and nonreactive techniques; survey design and implementation; systematic observation techniques. Also covered are systems analysis and man/machine systems; function and task analysis; task allocation; support equipment and training design; error analysis; occupational safety; preconstruction; periodic and accident/critical incident analytic techniques. *Prereq.: IIS 3509 and IIS 3400.*

IIS 3500 Principles of Dynamic Systems 4 Q.H. Spring Quarter

Introduction to modeling of social systems, emphasizing the study of feedback structures and their behavior; mechanisms underlying growth, stagnation and cyclical fluctuation; formulation of models of industrial, economic, social, and ecological systems; study of the effects of delays, multiple feedback loops, and nonlinearities. The aim is to build an intuitive foundation for simulation studies of complex systems and obtain exercise in model conceptualization. *Prereq.: Admission to Graduate Program.*

IIS 3501 Principles of Dynamic Systems I 2 Q.H. Spring Quarter

IIS 3501 and IIS 3502 cover the same material as IIS 3500, but in two 2 Q.H. courses

IIS 3502 Principles of Dynamic Systems II 2 Q.H. Spring Quarter

IIS 3501 and IIS 3502 cover the same materials as IIS 3500, but in 2 Q.H. courses.

IIS 3503 Simulation Methodology and Applications 4 Q.H. Winter and Spring Quarters

Course covers when, where, and how to use discrete event simulation techniques. Topics include model design, development, and validation; tactical and strategic planning considerations in the use of the model; input data reduction; alternative programming languages for implementing models; efficiency in running simulations, and statistical reliability in the design and analysis of simulation experiments. Several special purpose simulation languages are discussed, e.g., SIMSCRIPT, GPSS, and SIMAN. *Prereq.: IIS 3506 or IIS 3523 and higher-level language.*

IIS 3506 Statistics 4 Q.H. Fall and Winter Quarters

Basic tools of statistical inference are covered. These include limit theorems; point and interval estimators and properties of estimators; Bayes Hypothesis and hypothesis testing; one- and two-sided tests; power curve; nonparametric tests; statistical models for predication and analysis of random phenomena; multiple regression analysis; correlation; design and analysis of simple experiments. *Prereq.: IIS 3113.*

IIS 3509 Design of Experiments 4 Q.H. Fall Quarter

Theory and application of experimental design techniques such as modeling and statistics which can optimize resources and improve decision making risks. This course will cover experiments with single and multiple factors of interest and consider experiments with high order experimental restrictions. Some additional analyses techniques will also be covered. *Prereq.: IIS 3506.*

IIS 3510 Design of Experiments I 2 Q.H. Fall Quarter

IIS 3510 and IIS 3511 cover the same material, with the same prerequisite, as IIS 3509, but in two 2 Q.H. courses.

IIS 3511 Design of Experiments II 2 Q.H. Winter Quarter

IIS 3510 and IIS 3511 cover the same material as IIS 3509, but in two 2 Q.H. courses. *Prep. IIS 3510.*

IIS 3512 Queuing Theory and Its Applications (formerly 05.904) 2 Q.H. Spring Quarter

A development of the theory of queues with emphasis on practical applications, using the latest techniques of Markovian state-transition diagrams to simplify the mathematic model; study of models based on random arrivals and departures including exponential and Erlang service distributions, single and multiple services, series and parallel systems, finite and infinite queues; applications to staffing, inventory control, reliability, maintenance and scheduling. *Prereq.: IIS 3103.*

IIS 3514 Advanced Operations Research 4 Q.H. (formerly 05.914) Winter Quarter

Important families of mathematical programming problems and optimization methods will be covered. Generalized networks including the transshipment, shortest route, maximal flow and the minimal spanning tree problems. The cutting plane and the branch and bound algorithm for binary and mixed integer programming problems. Introduction to nonlinear programming including unconstrained optimization, the Kuhn-Tucker conditions, gradient methods, separable, quadratic and geometric programming. *Prep. IIS 3103.*

IIS 3517 Statistical Decision Theory 2 Q.H. (formerly 05.953) Winter Quarter

Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to game theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. *Prereq.: IIS 3506 and IIS 3523.*

IIS 3518 Advanced Quality Control 2 Q.H. (formerly 05.954) Fall Quarter

Mathematical methods of quality control; development of the process control charts for sampling by variables and by attributes; development of acceptance test procedures; development of life-testing plans; cost aspects of quality-control decisions. *Prereq.: IIS 3506 and IIS 3523.*

IIS 3522 Systems Engineering Design and Analysis **4 Q.H.****Spring Quarter**

The course covers principles of systems modeling and analysis using continuous simulation techniques. Topics include differential equations as system models; Laplace transformations; numerical approximation techniques; stability; steady-state error; control actions; alternative modeling scheme; and validation of system models via continuous simulation techniques. Emphasis is placed on concepts from the production and service-oriented industries. *Prereq.: Higher-level language.*

IIS 3523 Applied Statistics **4 Q.H.**
Fall, Winter and Spring Quarters

Development of complete statistical models for the predication and analysis of random phenomena. Topics include goodness of fit and nonparametric tests; analysis of variance; simple and multiple regression. Introduction to the design of experiments, quality control, decision analysis, reliability, and risk assessment. *Prereq.: IIS 3113.*

IIS 3524 Advanced Operations Research **4 Q.H.**
Topics**Spring Quarter**

Topics will include the revised simplex algorithm, parametric linear programming and the decomposition principle for large size multidivisional problems. Introduction to multi-criteria decision analysis, including the generation of the nondominated solution set, goal programming, evaluation of nondominated solutions and multi-criteria optimization applications. *Prep. IIS 3103.*

IIS 3525 Introduction to Reliability Analysis and Risk Assessment **4 Q.H.****Winter Quarter**

Introduction to probability theory, classical and Bayesian statistics useful for reliability analysis of large, complex systems. The course covers Bayesian probability encoding of experience data; principles of the methods of risk assessment and reliability analyses including fault trees, decision trees, and reliability block diagrams. Practical applications to industrial operations—e.g., nuclear and chemical plants, military systems, large processing plants—are treated. *Prereq.: Admission to Graduate Program.*

IIS 3526 Advanced Reliability Analysis, Risk Assessment, and Maintenance **4 Q.H.****Spring Quarter**

Extended application and use of reliability and probabilistic risk analysis methods. Methods for common cause/dependent failure analysis, human reliability analysis, and treatment of uncertainties. Bayesian statistics applied to data analysis and discrete probability distribution (DPD) arithmetic for propagation of uncertainty. Time-dependent reliability analysis; data types, variable and constant declarations; enumerations, arrays, sets, records, and pointers; input/

output library functions. The control structures of Modula-2: procedures, modules and visibility control. Also covered Oare sequential and screen-oriented input/output; recursion, concurrency and low-level facilities; software design using structured charts. *Prereq.: Admission to Graduate Program.*

IIS 3600 Basic Computer Systems Technology (formerly 05.930) **2 Q.H.****Fall, Winter and Spring Quarters**

Introduction to computer systems and assembly language programming using a language such as VAX MACRO. Topics include: machine language, and assemblers. Input/output device control. Students are required to prepare and test several programs. *Prereq.: Higher level language.*

IIS 3601 Compiler Design **4 Q.H.**
Winter Quarter

An introduction to data structures, including stacks and trees. The nature of compiling and interpreting, string manipulation, and code generation. The writing of a compiler in assembly language of a BASIC-like source language will be started. The compiler design work is completed as a term project. *Prereq.: IIS 3600 or IIS 3116.*

IIS 3604 Data Structures and Introduction to Data Base Management **4 Q.H.****Fall and Winter Quarters**

Treats the topics of computer files, file organization and processing, list and tree organization, and maintenance controls, for quality, protection, and security. Introduction to data base systems and their rise in corporations. Review of basic data storage concepts. Evolution and growth of data bases. Data organization, file creation, and management, using hashing, threaded lists, tree structures. Distributed data bases. Data base software, directory maintenance, types of data base languages, query languages. Data base management systems. Data base administration. *Prereq.: IIS 3615 or equivalent.*

IIS 3607 Operating Systems and Systems Software **4 Q.H.****Winter and Spring Quarters**

A study of the concept and components of modern operating systems: (1) evolution of modern operating systems; (2) operations and services of operating systems; (3) file systems, protection and implementation; (4) scheduling of processors, multiprogramming; (5) memory management, partitions, virtual memory, overlap, allocation algorithms; (6) secondary memory management, scheduling of disks and drums; (7) operating system deadlocks, detection and prevention; (8) concurrent processes, semaphores, concurrent programming, synchronization; (9) operating system protection, access matrix; (10) design issues, multilayered approach, virtual machines; (11) case studies in UNIX, VMS, TOPS, MULTICS. *Prep. IIS 3604 or IIS 3600 or equivalent.*

**IIS 3610 Computer Architecture
Fall and Spring Quarters****4 Q.H.**

Structure and organization of modern computers: computer systems organization; digital logic circuits, integrated circuits, programmed logic arrays; memory organizations, design techniques for large scale memories; microprocessors, comparative study of Z80, MC68000; interfacing, I/O chips; design specifications of model microcomputers; microprogramming, organization of data path and microarchitecture; instruction formats; operating system concepts; assemblers, linkers, loaders; multi-level machines, program portability; special topics on super computer architecture; multiprocessors; non-von Neumann architecture. *Prep. IIS 3600 or assembly language.*

**IIS 3613 Principles of Software Design
(formerly 05.947)****2 Q.H.****Fall and Spring Quarters**

Techniques for solving complex computer programming tasks include run-time structures in programming languages; communication, linking, and sharing of programs and data; interface design; program documentation; maintenance modification; testing and debugging. Current topics in program design such as readability, data abstraction, step-wise refinement and structured programming are also covered. *Prereq.: IIS 3607.*

**IIS 3614 Basic Information System
Technology (formerly 05.940)****2 Q.H.****Fall Quarter**

Introduction to the hardware and software which support computer-based management information systems, design, development, and operation. Topics include CPU instruction cycle; data conversion and data entry devices; secondary memory types; output and display devices; machine-oriented and high-level computer languages. Objective of the course is to develop capability in specifying software and equipment configuration appropriate to support a given set of management informational needs. *Prereq.: Admission to Graduate Program.*

**IIS 3615 Analysis and Design of
Computer Information Systems****4 Q.H.****Fall Quarter**

Introduction to computer information systems analysis and design techniques and the hardware and software which support such systems. Topics covered include: techniques for determining information requirements for MIS/DSSs; development of the functional systems design; computer system design considerations such as the CPU, main memory, operating systems functions, computer languages, input devices, secondary memory, file organization, database management systems, data communications, data security, and output and display devices. The main objective of the course is to develop capability in the skeletal design of a computer system to support a given set of management needs. *Prereq.: Admission to Graduate Program.*

**IIS 3617 Management Information
Systems (formerly 05.941)****2 Q.H.****Winter Quarter**

The development of a conceptual framework which emphasizes support to management decision making. Relevant cognitive and organizational characteristics of human decision making are integrated into a systems analysis approach to development of effective information systems. Case study discussions are used extensively to apply principles to realistic situations. IIS 3621 and IIS 3617 cover the same material as IIS 3218 but in two 2 Q.H. courses. *Prep. IIS 3614 or 3615.*

**IIS 3618 MIS: Planning, Control and
Development (formerly 05.942)****2 Q.H.****Fall Quarter**

Phases of MIS design and development are examined from a planning and control viewpoint. Techniques are presented for conceptual identification of a continuing stream of information system candidate projects, for achieving a user-oriented assessment of cost/benefit potential, and for control of the design and implementation effort. Case study discussions are used extensively to apply principles to realistic situations. *Prereq.: IIS 3614 or IIS 3615.*

**IIS 3620 Computerized Financial
Control Systems (formerly 05.944)****2 Q.H.****Spring Quarter**

Considers on-line systems for financial and inventory control from the technological, legal, and social point of view. The focus of the course is on electronic funds transfer (EFT) and point of sale (POS) terminals and associated computing equipment for inter-bank and consumer banking transactions, debit card transactions, and retail management information systems to control cash and inventory. The current technological status and societal implications of EFT and POS terminals are discussed. *Prereq.: IIS 3614 or IIS 3615.*

**IIS 3621 Information Systems and Society
(formerly 05.948)****2 Q.H.****Fall Quarter**

Discussion of the role computer systems play in modern society. The beneficial use of computers in commercial and industrial enterprises is considered and contrasted with the potential for infringement of individual privacy rights. Sufficient technical material on computer hardware, software, and data communications is discussed to permit assessment of system feasibility. Relevant major legislation is related to current practice in use of computer systems. IIS 3621 and IIS 3617 cover the same material as IIS 3218, but in two 2 Q.H. courses. *Prep. Admission to Graduate Program.*

**IIS 3622 Information Systems in a
Microcomputer Environment****4 Q.H.****Spring Quarter**

Explores the role of microcomputers, networks of microcomputers, and larger machines in providing

decision-aiding information. Topics include elements of office automation, local area networks, data communications, and micro- and minicomputer-based decision-support software. Emphasis is placed on the application of software packages to case problems. Specific IBM software includes KnowledgeMan, Superwriter, Lotus 1-2-3, dBase II, and Number Cruncher. On the VAX11/780, exposure to Runoff, INGRES, and DATATRIEVE will be provided. *Prereq.* IIS 3614 or equivalent.

IIS 3623 File Processing **2 Q.H.**
(formerly 05.938)

Winter Quarter

Processing of sequential, indexed-sequential, and direct/relative data files on tape and disk; record blocking, searching, sorting, and merging operations; random access techniques; introduction to data base management concepts, and if time permits an introduction to RPG. *Prereq.*: Knowledge of COBOL programming.

IIS 3624 Software Engineering I **4 Q.H.**
Winter Quarter

An introductory course on software design techniques. Software requirements and specifications. System architecture design methodology: classifications, top-down, bottom-up, HIPO, Warnier-Orr and Jackson design methodologies. Data flow charts; module strength and independence; software reliability and maintainability in the design stage. Elements of programming methodology: style, tools, environments, documentation. Software project management. Analysis of programming languages in the light of software engineering principles. *Prep.* IIS 3115.

IIS 3625 Software Engineering II **4 Q.H.**
Spring Quarter

Advanced topics in software engineering: software complexity measures; memory requirements and processing time analysis; program testing and debugging methods; proving programs correct; implementation issues; elements of reliability theory and applications to software engineering. Management of software design projects; an examination of software efficiency principles through case studies of large software projects. Application and comparison of various software development tools. *Prep.* IIS 3625.

IIS 3626 Networks and Telecommunications **4 Q.H.**
Winter and Spring Quarters

Network goals and applications; architecture, topologies, and protocols; layered communications protocol design; layer functions, interlayer interfaces, and peer processes; performance measures; data communication techniques; wide area and local networks; channel interfaces and access schemes; workstations and server nodes; distributed systems; internetworking. *Prereq.*: Admission to Graduate School.

IIS 3627 Software Economics **4 Q.H.**
Winter Quarter

An examination of the constructive cost model (COCOMO model) is presented in the context of the software life cycle. Case studies will be analyzed. Economic analysis tools are presented relative to software development and/or selection; marginal analysis, present value, future worth and systems analysis techniques. Methods for dealing with uncertainty and performing risk analyses. A seven step program for estimating software cost; COCOMO cost drivers, evaluation procedures and software project planning and control. *Prep.* IIS 3624.

IIS 3650 Engineering Analysis Utilizing Data Processing (formerly 05.916) **2 Q.H.**

Spring Quarter

Application of computers and major high-level computer languages to the solution of engineering problems. FORTRAN and GPSS are employed in applications drawn from production and service-oriented industries to illustrate topics such as generation of random numbers, inventory simulation models, file search and sorting techniques, and root-finding algorithms. The software packages SPSS and MPOS are introduced. *Prereq.*: Higher level language.

IIS 3651 Software Engineering Project **8 Q.H.**
Spring Quarter

Individual work under faculty supervision. Projects highlighting typical software engineering problems could include: development of integratable RAM resident software for desk-top functions; operating systems development; data base management systems; an enhanced word processor—spelling checker—document formatter; language and compiler projects; development of software engineering tools; software for an engineering workstation. *Prep.* IIS 3624, IIS 3625; permission of instructor.

IIS 3797 Engineer Degree Continuation **0 Q.H.**
Any Quarter

IIS 3798 Master's Thesis Continuation **0 Q.H.**
(formerly 05.9X1)

Any Quarter

IIS 3799 PhD Continuation **0 Q.H.**
(formerly 05.9X5)

Any Quarter

IIS 3801 Special Project in Industrial Engineering (formerly 05.993) **2 Q.H.**

Any Quarter

Individual work under faculty supervision. *Prereq.*: Permission of instructor.

IIS 3802 Special Project in Industrial Engineering **4 Q.H.**

Any Quarter

Same as IIS 3801.

IIS 3803 Independent Study in Operations Research (formerly 05.919) **2 Q.H.**

Any Quarter

Special topics in Operations Research by arrangement with a faculty member.

IIS 3804 Special Topics Any Quarter Special topics in IE and IS. <i>Prereq.: Permission of instructor.</i>	4 Q.H.	IIS 3870 Industrial Engineer Degree Project (formerly 05.994) Any Quarter Undertaken with the approval of the candidate's adviser and the Department Graduate Committee.	10 Q.H.
IIS 3805 Special Topics Any Quarter Special topics in IE and IS. <i>Prereq.: Permission of instructor.</i>	2 Q.H.	IIS 3871 Industrial Engineer Degree Project Any Quarter Same as IIS 3870.	4 Q.H.
IIS 3806 Seminar in Industrial Engineering (formerly 05.992) Any Quarter Discussion and presentations of thesis-related topics by students, presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Field trips and visitations included where appropriate. <i>Prereq.: Permission of instructor.</i>	2 Q.H.	IIS 3873 Industrial Engineer Degree Project Any Quarter Same as IIS 3870.	8 Q.H.
IIS 3860 Thesis (Master's Degree) (formerly 05.991) Any Quarter Analytical and/or experimental work conducted under the auspices of the Department. <i>Prep. Consent of adviser.</i>	8 Q.H.	IIS 3874 Industrial Engineer Degree Project Any Quarter Same as IIS 3870.	2 Q.H.
IIS 3863 Thesis (Master's Degree) Any Quarter Analytical and/or experimental work conducted under the auspices of the Department. <i>Prereq.: Consent of adviser.</i>	8 Q.H.	IIS 3880 Doctoral Thesis Any Quarter Doctoral thesis research conducted under advisership of the doctoral student's dissertation committee.	10 Q.H.
IIS 3862 Thesis (Master's Degree) Any Quarter Same as IIS 3863.	2 Q.H.	IIS 3881 Doctoral Thesis Any Quarter Same as IIS 3880.	4 Q.H.
		IIS 3883 Doctoral Thesis Any Quarter Same as IIS 3880.	8 Q.H.
		IIS 3884 Doctoral Thesis Any Quarter Same as IIS 3880.	2 Q.H.

Mechanical Engineering

Each course description includes information on the expected quarter in which classes are usually offered. The quarters listed are presented here for planning purposes; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter and at what day and time. 'Odd' and 'Even' years refer to the fall quarter of the academic year, i.e., Spring '87 which is in the 86-87 academic year, would be an 'Even' year.

ME 3100 Mathematical Methods for Mechanical Engineers (formerly 02.825) Fall Quarter Embodies the material in ME 3101 and ME 3102. <i>Prereq.: Admission to the Graduate School of Engineering.</i>	4 Q.H.	ME 3102 Mathematical Methods for Mechanical Engineers II (formerly 02.827) Winter Quarter Vector analysis; divergence theorem; functions of a complex variable; Laurent series and singular points; residues and contour integration; applications. <i>Prereq.: Admission to the Graduate School of Engineering.</i>	2 Q.H.
ME 3101 Mathematical Methods for Mechanical Engineers I (formerly 02.826) Fall Quarter Bessel and Legendre functions: boundary-value problems and series of orthogonal functions. Partial differential equations and applications to heat transfer, fluid flow, vibrations and wave propagation. <i>Prereq.: Admission to the Graduate School of Engineering.</i>	2 Q.H.	ME 3120 Theory of Elasticity (formerly 02.807) Fall Quarter Embodies the material in ME 3121 and ME 3122. <i>Prereq.: Admission to the Graduate School of Engineering.</i>	4 Q.H.

ME 3121 Theory to Elasticity I **2 Q.H.**
(formerly 02.804)**Fall Quarter**

Analysis of Cartesian tensors using indicial notation. Stress and strain concepts; point stress and strain; relation to tensor concepts. Governing equations for the determination of stress and displacement distributions in a solid body. Exact solutions of the governing equations for elastic solids. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3122 Theory of Elasticity II **2 Q.H.**
(formerly 02.805)**Winter Quarter**

Plane stress and strain problems in rectangular and polar coordinates including thermal stress. Relation of elasticity theory to strength of materials. Torsion of prismatic and axially symmetric bars. Bending of thin flat rectangular and circular plates. *Prereq.: ME 3121.*

ME 3140 Advanced Dynamics **4 Q.H.**
Fall Quarter

Embodies the material in ME 3141 and ME 3142. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3141 Advanced Dynamics I **2 Q.H.**
(formerly 02.847)**Fall Quarter**

Kinematics of particles and rigid bodies. Modeling and application of fundamental laws of motion. Dynamic response of lumped parameter systems. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3142 Advanced Dynamics II **2 Q.H.**
(formerly 02.848)**Winter Quarter**

Continuation of ME 3141. Lagrange's equations. Applications in two and three dimensions. *Prereq.: ME 3141.*

ME 3200 General Thermodynamics **4 Q.H.**
(formerly 02.903)**Winter Quarter**

Fundamentals of equilibrium thermodynamics will be examined. Topics include: work, energy, heat, temperature, available energy, entropy, first and second laws of thermodynamics, simple systems, closed and open systems, availability loss and irreversibility, heat engines, multicomponent systems, mixtures of gases, chemical reactions and chemical equilibrium. Equivalent to courses ME 3201 and ME 3202. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3201 General Thermodynamics I **2 Q.H.**
(formerly 02.901)**Fall Quarter**

ME 3201 and ME 3202 present the same material contained in ME 3200 but in two 2 Q.H. courses. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3202 General Thermodynamics II **2 Q.H.**
(formerly 02.902)**Winter Quarter**

Continuation of ME 3201. *Prereq.: ME 3201.*

ME 3210 Essentials of Fluid Dynamics **4 Q.H.**
(formerly 02.821)**Fall Quarter**

This is a fundamental course in fluid dynamics designed to prepare the student for more advanced courses in the thermofluids curriculum while providing a strong background in fluid mechanics. Topics to be covered may include: Cartesian tensors; differential and integral formulation of the equations of conservation of mass, momentum and energy; molecular and continuum transport phenomena; The Navier-Stokes equations; Vorticity; inviscid, incompressible flow, the velocity potential and Bernoulli's equation; viscous incompressible flow; the stream function; some exact solutions; energy equation including heat conduction and viscous dissipation. This material is also covered in the two 2 Q.H. courses ME 3211 and ME 3212. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3211 Essentials of Fluid Dynamics I **2 Q.H.**
(formerly 02.819)**Fall Quarter**

ME 3211 and ME 3212 present the same material with the same prerequisites as ME 3210, but in two 2 Q.H. courses. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3212 Essentials of Fluid Dynamics II **2 Q.H.**
(formerly 02.820)**Winter Quarter**

Continuation ME 3211. *Prereq.: ME 3211.*

ME 3250 Advanced Physical Metallurgy I **2 Q.H.**
(formerly 02.953)**Fall Quarter, Odd Years**

Dislocation theory; including such topics as dislocation stress fields, self-energy, velocity, interactions mechanisms, image forces, and theories of yielding. *Prep. A recent introductory material science course.*

ME 3251 Advanced Physical Metallurgy II **2 Q.H.**
(formerly 02.954)**Winter Quarter, Odd Years**

Mechanical behavior of metals. Application of dislocation theory to micro-plasticity, strain hardening, strengthening mechanisms and creep. *Prep. ME 3250.*

ME 3260 Thermodynamics of Materials I **2 Q.H.**
(formerly 02.960)**Fall Quarter, Odd Years**

Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prereq.: Engineering materials.*

ME 3261 Thermodynamics of Materials II **2 Q.H.**
(formerly 02.961)**Winter Quarter, Odd Years**

Continuation of ME 3260 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems. *Prereq.: ME 3260.*

ME 3270 Material Science and Engineering I (formerly 02.970) **2 Q.H.**
Fall Quarter, Even Years

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prereq.: A recent introductory material science course.*

ME 3271 Material Science and Engineering II (formerly 02.971) **2 Q.H.**
Winter Quarter, Even Years

Continuation of ME 3270 into additional topics such as electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prereq.: ME 3270.*

ME 3341 Power Generating Systems I **2 Q.H.**
(formerly 02.935)
Fall Quarter

Power generating systems that employ fossil, nuclear, and heat recovery boilers operating in conjunction with steam and organic Rankine cycles are examined. The steady-state and transient operation of each power-generating system is studied from both an analytical and conceptual point of view. The effect that site conditions, fuel quality, plant loading schedule and environmental regulations have on system design, performance and operation is presented. *Prereq.: ME 3200 or equivalent, or may be taken concurrently with permission of instructor.*

ME 3342 Power Generating Systems II **2 Q.H.**
(formerly 02.936)
Winter Quarter

An extension of ME 3341. The same type of examination is conducted of systems incorporating gas, hydraulic, and wind turbines, solar and fuel cells, energy storage, combined cycles, and cogenerating systems. The objective of Power Generating Systems I and II is to develop the skills needed to conduct sound technical evaluations of the power generating systems being built today. *Prereq.: ME 3341.*

ME 3343 Power Generation Economics and Planning (formerly 02.938) **2 Q.H.**
Spring Quarter

Current and constant-dollar power generation costs are examined. Life-cycle economic analysis, such as revenue requirements, discounted cash flow, internal rate of return, and payback analyses are presented. The planning methodologies used by electric utilities and private industry to evaluate and select power generating systems are presented. *Prereq.: ME 3342.*

ME 3351 Solar Thermal Engineering I **2 Q.H.**
(formerly 02.855)
Fall Quarter, Odd Years

A model is developed for the hourly direct and diffuse radiation under a cover of scattered clouds and the transmission and absorption of this radiation by passive and active systems. The design of air heating systems and the storage of the collected energy by a pebble-bed are considered, as well as elements of heat exchanger design. A study of the economics of a domestic water and/or space heating system is made using f-chart analysis. *Prereq.: CHE 3660, Solar Energy Thermal Processes or equivalent background.*

ME 3352 Solar Thermal Engineering II **2 Q.H.**
(formerly 02.856)
Winter Quarter, Odd Years

The design and analysis of several solar thermal systems are considered, such as: LiBr-H₂O absorption cooling units, heat pumps, compound parabolic collectors, and the heat pipe type of solar collector. *Prereq.: ME 3351.*

ME 3361 Turbomachinery Design I **2 Q.H.**
(formerly 02.930)
Fall Quarter

Preliminary design methods and analytical tools applicable to turbomachinery in general, including velocity diagram selection and limitations of diffusion, are presented. Design criteria and performance characteristics at design and off-design operating conditions are discussed for several important types of turbomachinery. Axial flow compressors and turbines (gas and steam) are studied in some depth, including topics such as compressor surge, turbine blade cooling, and steam wetness effects. Centrifugal compressors, radial inflow turbines, pumps, fans, and water turbines are also studied. Turbomachinery mechanical design limitations are discussed. The use of empirical data on blade cascade performance in blade selection is examined. Numerical methods of analyzing two- and three-dimensional flows in turbomachinery (e.g., conformal transformation and streamline curvature) are presented. Two in-depth design projects (one per quarter) are assigned. *Prereq.: Admission to the Graduate School of Engineering, and undergraduate preparation in fluid mechanics and thermodynamics.*

ME 3362 Turbomachinery Design II **2 Q.H.**
(formerly 02.931)
Winter Quarter

Continuation of ME 3361. *Prereq.: ME 3361.*

ME 3370 Fundamentals of Maintenance in Design **4 Q.H.**

Fall Quarter, As Announced

Basic tools of probability analysis will be covered. Failure modes and actual functional behavior of designed components will be presented in the probability forms. Age reliability will be discussed. Non-descriptive evaluation techniques will be presented and demonstration tests will be performed. Fault

tree analysis and decision logic will be covered.
Prep. Admission to the Graduate School of Engineering.

ME 3380 Fundamentals of Instrumentation 2 Q.H.
(formerly 02.853)

Fall Quarter

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prereq.: Bachelor of Science degree.*

ME 3381 Industrial Process Control 2 Q.H.
(formerly 02.854)

Winter Quarter

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, PH. *Prereq.: ME 3380.*

ME 3386 Nuclear Engineering I 2 Q.H.
(formerly 02.942)

Fall Quarter, Even Years

Topics include: growth of nuclear power industry; study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion; radiation health physics; principles of shielding; nuclear instrumentation; production and application of radioisotopes; neutron interactions and slowing down theory; neutron activation analysis. (Not open to students who have completed ME 1541 and ME 1542). *Prereq.: Admission to the Graduate School of Engineering.*

ME 3387 Nuclear Engineering II 2 Q.H.
(formerly 02.943)

Winter Quarter, Even Years

Comparison of thermal, fast, and breeder reactors; four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multi-group theory; bare and reflected thermal reactors; energy production and distribution within core; flux shaping; transient reactor behavior and control; factors affecting reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; Xenon buildup after shutdown. (Not open to students who have completed ME 1541 and ME 1542). *Prereq.: ME 3386.*

ME 3388 Nuclear Engineering III 2 Q.H.
(formerly 02.944)

Spring Quarter, Even Years

Reactor design considerations; interrelationship of reactor physics, control, engineering, materials, safety, and fuel cycle management; reactor types; radiation damage and reactor materials; nuclear fuels; reactor heat transfer; economics of nuclear power; environmental effects. (Not open to students who have completed ME 1541 and ME 1542). *Prereq.: ME 3387.*

ME 3401 Advanced Math Methods for 2 Q.H.
Mechanical Engineers I (formerly 02.828)

Spring Quarter, Even Years

Matrices and linear equations. Variational calculus and applications. Approximate methods of engineering analysis. Selected topics of current interest. *Prereq.: ME 3101 and ME 3102.*

ME 3402 Advanced Math Methods for 2 Q.H.
Mechanical Engineers II

Spring Quarter, Odd Years

Integral transforms; asymptotic expansion; regular and singular perturbation methods. Examples drawn from solid mechanics, vibration, and fluid mechanics. *Prereq.: ME 3101 and ME 3102.*

ME 3410 Numerical Methods in 4 Q.H.
Mechanical Engineering

All Winter Quarters, Fall Quarter, Even Years

Numerical methods applied to problems in mechanical engineering. Solution of linear and nonlinear systems of equations, interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations: explicit and implicit methods, multistep methods, predictor-corrector methods. Numerical solution of partial differential equations with emphasis on parabolic and elliptic problems occurring in mechanical engineering. This material is also covered in the two 2 Q.H. courses ME 3411 and ME 3412. *Prereq.: ME 3100.*

ME 3411 Numerical Methods in 2 Q.H.
Mechanical Engineering I

As Announced

ME 3411 and ME 3412 present the same material with the same prerequisites as ME 3410, but in two 2 Q.H. courses.

ME 3412 Numerical Methods in 2 Q.H.
Mechanical Engineering II

As Announced

Continuation of ME 3411. *Prereq.: ME 3411.*

ME 3420 Mechanics of Inelastic Solids 4 Q.H.
Spring Quarter

Constitutive relations governing inelastic solids. Yield surface; plastic stress-strain relations; Prandtl-Reuss equations. Viscoelastic stress-strain relations including the Maxwell and Voigt models. Viscoplasticity. *Prereq.: ME 3122. Not available to students who have taken ME 3421.*

ME 3421 Introduction to Plasticity 2 Q.H.
(formerly 02.809)

Winter Quarter, Even Years

Basic experimental information. Review of stress and strain tensors. Elastic stress-strain relations. Yield surface. Plastic stress-strain relations. Prandtl-Reuss equations. Simple applications. *Prereq.: ME 3121.*

ME 3423 Advanced Theory of Elasticity 2 Q.H.
(formerly 02.806)

Spring Quarter

Approximate solutions for stress and displacement distributions in elastic solids; discrete solutions

using finite difference and finite element methods; energy principles and the calculus of variations; use of energy principles to obtain approximate continuous solutions. *Prereq.: ME 3122, Theory of Elasticity II.*

ME 3432 Engineering Fracture Mechanics I (formerly 02.838) 2 Q.H.

Fall Quarter, Odd Years

Fundamentals of brittle fracture; theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, applicability of same. Linear elastic fracture mechanics; Orowan/Irwin extension to metals, effective surface tension and relation to fracture toughness, plastic zone size correction; geometry effects on fracture toughness; plane strain/plane stress fracture toughness, thickness effects. *Prereq.: ME 3122.*

ME 3433 Engineering Fracture Mechanics II (formerly 02.839) 2 Q.H.

Winter Quarter, Odd Years

Experimental determination of fracture toughness; slow crack growth "pop in," arrest, R-G curves, compliance techniques for determining elastic energy release rate. Alternate fracture toughness concepts; resistance curve, crack opening displacement, the J integral. Application of fracture mechanics to fatigue. Design methods to minimize risks of catastrophic failure will be emphasized. *Prereq.: ME 3432.*

ME 3434 Engineering Fracture Mechanics (formerly 02.829) 2 Q.H.

Spring Quarter, Odd Years

Application of fracture mechanics to fatigue, strain energy density criteria for fracture, arrest criteria. "Work of Fracture" specimen. Application of fracture mechanics to structural analysis. Effect of anisotropy in fracture mechanics. Fracture dynamics, dynamic fracture toughness, strain rate effects. Microsecond fracture phenomenon and criteria, spall, Butcher-Tuler criterion, NAG model. Residual strength, design approaches will be emphasized. *Prereq.: ME 3433.*

ME 3440 Advanced Mechanics of Materials (formerly 02.812) 4 Q.H.

Winter Quarter

Embodies the material in ME 3441 and ME 3442. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3441 Advanced Mechanics of Materials I (formerly 02.810) 2 Q.H.

Fall Quarter

Review of fundamental stress and deformation concepts; strain energy density; introduction to energy methods with application to beams, frames and rings; Ritz method. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3442 Advanced Mechanics of Materials II (formerly 02.811) 2 Q.H.

Winter Quarter

Beams on elastic foundations. Concept of stability as applied to one and two degree-of-freedom systems. Buckling of bars, frames and rings. *Prereq.: ME 3441.*

ME 3443 Advanced Mechanics of Materials III (formerly 02.813) 2 Q.H.

Spring Quarter, Even Years

Selected topics in advanced mechanics; will vary with current interest. *Prereq.: ME 3442, Advanced Mechanics of Materials II or consent of the instructor.*

ME 3446 Theory of Shells (formerly 02.815) 2 Q.H.

Spring Quarter, Odd Years

Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. *Prereq.: ME 3122.*

ME 3455 Mechanics of Composite Materials (formerly 02.816) 2 Q.H.

Winter Quarter, Odd Years

Constitutive equations for anisotropic laminated composite materials, and application to the structural response of beams and plates. Bending and buckling of symmetric and nonsymmetric laminates. *Prereq.: ME 3121.*

ME 3466 Automatic Control Engineering I (formerly 02.850) 2 Q.H.

Fall Quarter, Even Years

Study of control action; analysis and design by use of root-locus and frequency-domain techniques. *Prereq.: Permission of instructor.*

ME 3467 Automatic Control Engineering II (formerly 02.851) 2 Q.H.

Winter Quarter, Even Years

Further consideration of linear systems including compensation methods and multiple-input. Techniques for the treatment of nonlinear systems. *Prereq.: ME 3466.*

ME 3468 Robot Mechanics and Control 4 Q.H.

Spring Quarter

Kinematics and dynamics of robot manipulators are the focus of the first part of the course. Kinematics cover the development of kinematic equations of manipulators, the inverse kinematic problems, and motion trajectories. Dynamics of manipulators for the purpose of control are covered employing Lagrangian mechanics. The second part of the course focuses on the control and programming of robot manipulators. Steady state errors and calculations of servo parameters are covered. High level programming languages are discussed. *Prereq.: ME 3142.*

ME 3470 Vibration Theory and Applications (formerly 02.844) 4 Q.H.

Winter Quarter

Embodies the material in ME 3472 and ME 3473. *Prereq.: ME 3142 or ME 3471.*

ME 3471 Vibration Theory and Applications A (formerly 02.841) 2 Q.H.

As Announced

Modeling of vibratory systems; one-degree-of-freedom systems (determination of equations of motion

using free-body and energy methods); forced and free vibrations through two degrees of freedom. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3472 Vibration Theory and Applications I (formerly 02.842) **2 Q.H.**
Fall Quarter, Odd Years

Laplace transformation techniques; phase-plane diagrams; multiple-degree-of-freedom systems; free and forced vibrations with and without damping. *Prereq.: ME 3471 or ME 3142.*

ME 3473 Vibration Theory and Applications II (formerly 02.843) **2 Q.H.**
Winter Quarter, Odd Years

Systems with distributed mass and stiffness. Extensional, torsional and flexural vibrations of bars. *Prereq.: ME 3472.*

ME 3474 Vibration Theory and Applications III (formerly 02.846) **2 Q.H.**
As Announced

Selected topics of current interest in vibrations. *Prereq.: ME 3473.*

ME 3475 Random Vibration (formerly 02.845) **2 Q.H.**
Spring Quarter, Odd Years

Description of stochastic processes. Impulse response and frequency response of linear time-invariant dynamic systems. Correlations and spectra of stationary response. Crossing rates, peaks and envelopes. Failure under random loading. Poisson pulse processes. Measurement, identification, and response problems. Coherence. Space-time correlations and cross-spectra. Digital data processing. Application to vehicles and structures subjected to wide-band excitation. *Prereq.: ME 3473.*

ME 3480 The Finite Element Method (formerly 02.949) **4 Q.H.**
Spring Quarter

Embodies the material in ME 3481 and ME 3482. *Prereq.: ME 3101 and ME 3102 or consent of the instructor.*

ME 3481 Finite Element Analysis (formerly 02.840) **2 Q.H.**
Fall Quarter

Introduction to the finite element method. Variational formulations; simple interpolation functions and element stiffness matrices. Triangular and rectangular elements. Assembly technique and constraining of resulting equations. Elementary applications. *Prereq.: ME 3101 and ME 3102 or consent of the instructor.*

ME 3482 Advanced Finite Element Method I (formerly 02.947) **2 Q.H.**
Winter Quarter

Isoparametric element formulation of higher-order and three-dimensional elements. Rayleigh-Ritz and Galerkin formulations. Applications of finite element theory to mechanical engineering problems in the areas of solid mechanics, heat transfer, and fluid mechanics. The use of a finite element general

purpose commercial package is included. *Prereq.: ME 3481.*

ME 3483 Advanced Finite Element Method II (formerly 02.948) **2 Q.H.**
Spring Quarter, Even Years

The dynamic finite element formulation with explicit and implicit time integration schemes for transient analysis. Solution methods for finite element equilibrium equations, including material and geometrical nonlinearities. The general structure of computer procedures and codes. Influence of computer-aided design technology. Use of an in-house general purpose commercial code is included. *Prereq.: ME 3482.*

ME 3500 Computer-Aided Graphics and Design **4 Q.H.**
Winter Quarter

Basic aspects of interactive computer graphics are covered. Topics include hardware and software concepts, design principles for the user-computer interface, geometrical transformation, display architecture, and data structures. Algorithms for removing hidden edges and surfaces, shading models, and intensity and colors are also covered. The second part of the course deals with the concepts of computational and numerical geometry and design of curves and surfaces. Solid modeling techniques are presented. Discussions of in-house computer-aided graphics and design packages are included. *Prereq.: Admission to the Graduate School of Engineering and programming experience.*

ME 3540 Heat Conduction and Thermal Radiation (formerly 02.910 and 02.913) **4 Q.H.**
Winter Quarter

Formulation of steady and unsteady state one- and multidimensional heat conduction problems. Solution techniques for linear problems including the method of separation of variables, Laplace transforms and integral transforms. Approximate analytical methods. Phase change problems. Nonlinear problems. Nature of thermal radiation. Blackbody and radiation from a blackbody. Radiation from a nonblack surface element. Radiative exchange among surfaces separated by a nonparticipating medium. Interaction of radiation with other modes of heat transfer in nonparticipating media. Numerical techniques in heat transfer are covered in ME 3410. Engineering. This material is also covered in the two 2 Q.H. courses ME 3541 and ME 3542. *Prereq.: ME 3100 and undergraduate course in heat transfer.*

ME 3541 Heat Conduction and Thermal Radiation I (formerly 02.910) **2 Q.H.**
Fall Quarter

ME 3541 and ME 3542 present the same material with same prerequisites as ME 3540, but in two 2 Q.H. courses.

ME 3542 Heat Conduction and Thermal Radiation II (formerly 02.913) **2 Q.H.**
Winter Quarter

Continuation of ME 3541. *Prereq.: ME 3541.*

ME 3544 Convective Heat Transfer 4 Q.H.
(formerly 02.911)**Winter Quarter, Even Years; Fall Quarter, Odd Years**

Fundamental equations of convective heat transfer. Heat transfer in incompressible external laminar boundary layers. Integral boundary layer equations. Laminar forced convection in internal flows. Turbulent forced convection in internal and external flows. Analogies between heat and momentum transfer; the Reynolds, Taylor and Martinelli analogies. Natural convection. Heat transfer in high-speed flow. Transient forced convection. Convection and radiation in nonparticipating media. This material is also covered in the two 2 Q.H. courses ME 3545 and ME 3546. *Prereq.: ME 3100, ME 3210 and an undergraduate course in Heat Transfer.*

ME 3545 Convective Heat Transfer I 2 Q.H.
(formerly 02.911)**As Announced**

ME 3545 and ME 3546 present the same material with the same prerequisites as ME 3544, but in two 2 Q.H. courses.

ME 3546 Convective Heat Transfer II 2 Q.H.
(formerly 02.911)**As Announced**

Continuation of ME 3545. *Prereq.: ME 3545.*

ME 3548 Radiative Transfer 4 Q.H.
Spring Quarter

Electromagnetic background. Fundamentals of radiation in absorbing, emitting and scattering media. Equation of radiative transfer. Approximate methods in the solution of the equation of radiative transfer. Singular-eigenfunction expansion technique. Pure radiative transfer in participating media. Interaction of radiation with conduction and/or convection. The Monte Carlo technique. This material is also covered in the two 2 Q.H. courses ME 3549 and ME 3550. *Prereq.: ME 3540.*

ME 3549 Radiative Transfer I 2 Q.H.
As Announced

ME 3549 and ME 3550 present the same material with the same prerequisites as ME 3548, but in two 2 Q.H. courses.

ME 3550 Radiative Transfer II 2 Q.H.
As Announced

Continuation of ME 3549. *Prereq.: ME 3549.*

ME 3552 Two Phase Flow 4 Q.H.
Winter, Odd Years

This course is aimed at the understanding of the basic concepts of heat and mass transfer associated with phase change and multiphase flows. Some of the specific subjects to be discussed are: boiling heat transfer (nucleate boiling, film boiling and bubble dynamics); evaporation and condensation; liquid-gas two phase flow and gas-solid and liquid-solid two phase flows. This material is also covered in the two 2 Q.H. courses ME 3553 and ME 3554. *Prereq.: ME 3100 (or equivalent) and undergraduate course in Heat Transfer.*

ME 3553 Two Phase Flow I 2 Q.H.
As Announced

ME 3553 and ME 3554 present the same material as ME 3552 with the same prerequisites, but in two 2 Q.H. courses.

ME 3554 Two Phase Flow II 2 Q.H.
As Announced

Continuation of ME 3553. *Prereq.: ME 3553.*

ME 3556 Heat Transfer Processes in 4 Q.H.
Microelectronic Devices
Spring Quarter

The course will discuss and develop state-of-the art methods used to predict the heat transfer rates from microelectronic devices and packages and to simulate transport phenomena in manufacturing processes associated with microelectronic devices. Topics will be selected from the current literature and may include use of latent heat reservoirs, boiling jet impingement cooling, control volume approaches to extended surfaces, calculation of thermal contact conductances and natural convection in enclosures. Simulation of laser-assisted thermophoretic deposition and laser cladding processes will also be developed. This material is also contained in the two 2 Q.H. courses ME 3557 and ME 3558. *Prereq.: ME 3100 (or equivalent) and undergraduate course in Heat Transfer or consent of instructor.*

ME 3557 Heat Transfer Processes in 2 Q.H.
Microelectronic Devices I**As Announced**

ME 3557 and ME 3558 provide the same material as ME 3556 with the same prerequisites, but in two 2 Q.H. course.

ME 3558 Heat Transfer Processes in 2 Q.H.
Microelectronic Devices II**As Announced**

Continuation of ME 3557. *Prereq.: ME 3557.*

ME 3560 Viscous Flow 4 Q.H.
Spring Quarter

Review of conservation of mass, momentum, and energy for compressible viscous flow. Discussion of the mathematical character of the basic equations and analysis of some exact solutions. Investigation of low Reynolds number flow. Exact and approximate approaches to laminar boundary layers in high Reynolds number flows. Stability of laminar flows and the transition to turbulence. Treatment of incompressible turbulent mean flow; internal and external flows. Extensions to compressible boundary layers. This material is also covered in the two 2 Q.H. courses ME 3561 and ME 3562. *Prereq.: ME 3100 and ME 3210.*

ME 3561 Viscous Flow I 2 Q.H.
As Announced

ME 3561 and ME 3562 present the same material with the same prerequisites as ME 3560, but in two 2 Q.H. courses.

ME 3562 Viscous Flow II 2 Q.H.**As Announced**

Continuation of ME 3561. *Prereq.: ME 3561.*

**ME 3564 Gas Dynamics 4 Q.H.
(formerly 02.823 and 02.824)****Spring Quarter, Even Years**

The consequences of fluid compressibility are studied. Shock waves and the theory of characteristics are discussed with specific consideration given to two-dimensional steady flows and one-dimensional unsteady flows. Additional topics may include axially symmetric steady flow, small perturbation theory, similitude rules, the hodograph method, or some aspects of physical acoustics. This material is also contained in the two 2 Q.H. courses ME 3565 and ME 3566. *Prereq.: ME 3210.*

**ME 3565 Gas Dynamics I 2 Q.H.
(formerly 02.823)****As Announced**

ME 3565 and ME 3566 present the same material with the same prerequisites as ME 3564, but in two 2 Q.H. courses. *Prereq.: ME 3210.*

**ME 3566 Gas Dynamics II 2 Q.H.
(formerly 02.824)****As Announced**

Continuation of ME 3565. *Prereq.: ME 3565.*

**ME 3568 Computational Fluid Dynamics 4 Q.H.
with Heat Transfer****All Spring Quarters, Fall Quarter, Odd Years**

Finite difference methods for solving partial differential equations with particular emphasis on the equations of fluid dynamics and convective heat transfer. Integral methods for boundary layers and their coupling to potential flow solutions. Use of coordinate transformations and body-oriented coordinate systems. Application of superposition techniques in convective heat transfer problems. This material is also covered in the two 2 Q.H. courses ME 3569 and ME 3570. *Prereq.: ME 3210 and ME 3410.*

**ME 3569 Computational Fluid Dynamics 2 Q.H.
with Heat Transfer I****As Announced**

ME 3569 and ME 3570 present the same material with the same prerequisites as ME 3568, but in two 2 Q.H. courses.

**ME 3570 Computational Fluid Dynamics 2 Q.H.
with Heat Transfer II****As Announced**

Continuation of ME 3569. *Prereq.: ME 3569.*

**ME 3580 Statistical Thermodynamics 4 Q.H.
(formerly 02.904)****Spring Quarter, Odd Years**

This is an introductory course in statistical thermodynamics for mechanical engineers designed to provide insight into the laws of classical thermodynamics and the behavior of substances. Topics to be covered include: introduction to probability; elemen-

tary kinetic theory of an ideal gas, including the distribution of molecular velocities and the mean free path treatment of transport properties; classical statistics of independent particles, equipartition of energy, the partition function and laws of thermodynamics; some results from quantum mechanics, quantum statistics of independent particles; applications to gases; introduction to ensembles and systems of interacting particles. This material is also contained in the two 2 Q.H. courses ME 3581 and ME 3582. *Prereq.: ME 3100 and ME 3200 or equivalent.*

**ME 3581 Statistical Thermodynamics I 2 Q.H.
(formerly 02.904)****As Announced**

ME 3581 and ME 3582 present the same material with the same prerequisites as ME 3580, but in two 2 Q.H. courses.

**ME 3582 Statistical Thermodynamics II 2 Q.H.
(formerly 02.904)****As Announced**

Continuation of ME 3581. *Prereq.: ME 3581.*

**ME 3584 Fundamentals of Combustion 4 Q.H.
(formerly 02.927)****Spring Quarter, Even Years**

Comprehensive treatment of the problems involved in the combustion of liquid, gaseous, and solid fuels in both laminar and turbulent flow. The fundamentals of chemical kinetics will be discussed. The equations for the transport of mass, momentum, and energy with chemically reacting gases will be examined. Topics will include diffusion and premixed flames, combustion of droplets and sprays, and gasification and combustion of coal. This material is also presented in the two 2 Q.H. courses ME 3585 and ME 3586. *Prereq.: ME 3200.*

**ME 3585 Fundamentals of Combustion I 2 Q.H.
(formerly 02.927)****As Announced**

ME 3585 and ME 3586 present the same material as ME 3584, with same prerequisites, but in two 2 Q.H. courses.

**ME 3586 Fundamentals of Combustion II 2 Q.H.
(formerly 02.927)****As Announced**

Continuation of ME 3585. *Prereq.: ME 3585.*

**ME 3600 Advanced Physical Metallurgy III 2 Q.H.
(formerly 02.956)****Spring Quarter, Odd Years**

The kinetics of phase transformations in metals. Topics include kinetic theory, empirical kinetics, diffusion in metals, nucleation, diffusional growth, martensitic transformations. *Prep. A recent introductory material science course.*

**ME 3601 Thermodynamics of Materials III 2 Q.H.
(formerly 02.963)****Spring Quarter, Odd Years**

The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-

solid systems, etc., plus kinetics of reactions and dynamic systems analysis. *Prereq.: ME 3260 or ME 3261.*

ME 3602 Materials Science and Engineering III (formerly 02.972) **2 Q.H.**

Spring Quarter, Even Years

Continuation of ME 3271 plus a discussion of various special topics that will vary from year to year. Examples are: metastable phases and thin films. *Prereq.: ME 3271.*

ME 3603 Corrosion **2 Q.H.**
As Announced

This course will commence with the study of the thermodynamics of corrosion and corrosion reactions both in aqueous and non-aqueous environments. Topics will include thermodynamics, kinetics, and the effects of environment and physical metallurgy. Applications will be made to automotive design, and exterior and interior structures. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3604 Oxidation **2 Q.H.**
As Announced

This course will begin with the study of the thermodynamics of oxidation and the effect of environment on rates of oxidation. Topics will include thermodynamics, kinetics, mechanisms, and effect of environment. Ferrous and nonferrous metals as well as polymers will be assessed. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3605 Electronic Materials I **2 Q.H.**
Fall Quarter, Odd Years

Generic techniques for fabrication and processing, and the resulting structure-property relationships, are presented for materials utilized in electronics. Typically included are: bulk single crystals, thin films, metals, semiconductors, and insulators. *Prereq.: ME 3271.*

ME 3606 Electronic Materials II **2 Q.H.**
Winter, Odd Years

Continuation of ME 3605. *Prereq.: ME 3605.*

ME 3610 Introduction to Diffraction Methods in Material Science (formerly 02.975) **2 Q.H.**

Fall Quarter

General principles of the diffraction by materials of short wave length radiations; (such as x-ray, electrons, and thermal neutrons) are studied with emphasis on the understanding of the similarities and differences of the different radiations when applied to the study of the structures of crystalline and noncrystalline materials. *Prereq.: A recent introductory material science course.*

ME 3611 Diffraction Methods in Material Science (formerly 02.976) **2 Q.H.**

Winter Quarter

Continuation of ME 3610 with emphasis on the experimental methods and applications. This includes: choice of radiation, introduction to instrumentation, sample preparation, methods of detection and

recording of the diffracted radiation, analysis, interpretation and use of the results. *Prereq.: ME 3610.*

ME 3612 Microstructure Analysis I **2 Q.H.**
Fall Quarter, Even Years

Discussion of the principles of scanning and transmission electron microscopy. Image interpretation in transmission electron microscopy with emphasis on the study of the relationships between microstructure and properties of materials. Application of kinematical and dynamical theories of electron diffraction to quantitative analysis of point defects, dislocations, precipitates and grain boundaries etc. Laboratory demonstration of TEM and SEM operation. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3613 Microstructure Analysis II **2 Q.H.**
Winter, Even Years

Continuation of ME 3612. *Prereq.: ME 3612.*

ME 3620 Powder Metallurgy **2 Q.H.**
(formerly 02.985)

Spring Quarter, Even Years

Powder characteristics and methods of manufacture. Powder pressing: packing, interparticle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. *Prereq.: A recent introductory material science course.*

ME 3625 Physical Ceramics I **2 Q.H.**
(formerly 02.965)

Fall Quarter, Even Years

Introduction to ceramic fabrication processes. Characteristics of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. *Prereq.: A recent introductory material science course, physical chemistry, or solid state physics.*

ME 3626 Physical Ceramics II **2 Q.H.**
(formerly 02.966)

Winter Quarter, Even Years

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. *Prereq.: ME 3625.*

ME 3630 The Structure and Properties of Polymeric Materials I (formerly 02.958) **2 Q.H.**

Fall Quarter, Even Years

Introduction to the organic chemistry of polymers, effect of chemical composition on structure, melting point and glass transition temperature, polymer characterization and degradation, thermodynamics of polymers. *Prereq.: Undergraduate material science course.*

ME 3631 The Structure and Properties of Polymeric Materials II (formerly 02.959) **2 Q.H.**

Winter Quarter, Even Years

Rheology and mechanical behavior of polymers, analysis and testing, effects of processing on structure

and physical properties, industrial polymers, resin base composites. *Prereq.: ME 3630.*

ME 3640 Computer Modeling of Materials Processing 2 Q.H.

Fall Quarter, Even Years

This course focuses on the use of numerical methods for modeling a variety of materials processes, e.g. melting, oxidation, reduction, the blast furnace, the cupola, rolling, extrusion. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3641 Computer Modeling of Materials Properties 2 Q.H.

Winter Quarter, Even Years

Various mathematical techniques and computer methods will be used to develop models that describe the changes in a material's chemical, mechanical, and physical properties as the chemical composition and metallurgical variables are changed. *Prereq.: Admission to the Graduate School of Engineering.*

ME 3797 Engineer Degree Continuation 0 Q.H.
Any Quarter

ME 3798 Master's Degree Continuation (formerly 02.9X1) 0 Q.H.
Any Quarter

ME 3799 PhD Continuation 0 Q.H.
Any Quarter

ME 3850 Special Problems in Mechanical Engineering (formerly 02.992) 2 Q.H.
Any Quarter

Theoretical or experimental work under individual faculty supervision. *Prereq.: Consent of department faculty.*

ME 3853 Special Topics in Mechanical Engineering (formerly 02.993) 2 Q.H.
Any Quarter

Topics of interest to the staff member conducting this class are presented for advanced study. *Prereq.: Permission of department faculty.*

ME 3854 Special Topics in Mechanical Engineering 4 Q.H.
Any Quarter

Topics of interest to the staff member conducting this class are presented for advanced study. *Prep. Permission of department faculty.*

ME 3856 Doctoral Reading 2 Q.H.
(formerly 02.994)

Any Quarter

Material approved by the candidate's adviser (only S or F grades will be assigned for this course). *Prereq.: Passing of PhD qualifying exam.*

ME 3860 (Thesis Master of Science Degree) (formerly 02.991) 6 Q.H.

Any Quarter

Analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. *Prep. Admission to the Graduate School of Engineering.*

ME 3861 Thesis (Master of Science Degree) 4 Q.H.

Any Quarter

ME 3862 Thesis (Master of Science Degree) 2 Q.H.

Fall Quarter

ME 3870 Thesis (Mechanical Engineer Degree) (formerly 02.996) 10 Q.H.

Any Quarter

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prereq.: Admission to the Mechanical Engineer Degree Program.*

ME 3871 Thesis (Mechanical Engineer Degree) 4 Q.H.

Any Quarter

ME 3872 Thesis (Mechanical Engineer Degree) 2 Q.H.

Any Quarter

ME 3880 Dissertation (PhD Degree) (formerly 02.995) 0 Q.H.

Any Quarter

Theoretical and experimental work conducted under the supervision of the department. Open to day students only. *Prereq.: Admission to the Doctoral Program in Mechanical Engineering.*

Pharmacy and Allied Health Professions

Graduate School of Pharmacy and Allied Health Professions

INT 3101 Biochemistry I 2 Q.H.

Description of the biochemical components of the cell including carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, nucleic acids, and vitamins. Consideration of Henderson-Hasselbalch equation, buffers, and importance of pKa. *Prereq.: Two quarters of organic chemistry.*

INT 3102 Biochemistry II 2 Q.H.

Discussion of enzymes, enzyme kinetics, and mechanisms of enzyme reactions. An introduction to intermediary metabolism, and bioenergetics. A consideration is made of carbohydrate metabolism, including glycolysis, the citric acid cycle, the pentose phosphate pathway, and oxidative phosphorylation. Use of isotopes in biochemistry and the role of high-energy phosphate compounds are outlined. *Prereq.: INT 3101.*

INT 3103 Biochemistry III 2 Q.H.

Lipid metabolism is presented, including the fatty acid cycle, the biosynthesis of fatty acids, and the biological formation of the prostaglandins, cholesterol, and steroid hormones. The metabolism of the various amino acids is considered, including the area cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Metabolism of nucleic acids and their building blocks are discussed, as well as the genetic basis of protein synthesis, the genetic code, and the mechanisms of control. *Prereq.: INT 3102.*

INT 3201 Applications of Mass Spectrometry 2 Q.H.

A comprehensive examination of the principles governing the fragmentation and ionization of organic molecules, the interpretation of mass spectra, and discussion of applications of mass spectrometry to the solution of selected problems in the fields of chemistry, biochemistry, and forensic sciences. *Prereq.: 1 year of organic chemistry, basic physics, physical organic chemistry desirable but not essential.*

MHP 3101 Health Care Delivery 3 Q.H.

Principal components of the health care delivery system with emphasis on its social, political, and economic evolution and development. Future trends and their implications will be discussed.

MHP 3102 Health Research Methodology 3 Q.H.

Interpretation, analysis, and evaluation of research methods used in the literature of health care. Introduction to experimental designs and hypothesis testing. Projects in developing research methodology for prototype research studies in health care.

MHP 3103 Professional Dynamics in Health Care 3 Q.H.

Skills and techniques used in developing leadership attributes and in working effectively with individuals and groups in the health care environment. Emphasis is placed on presenting differing, successful approaches for both leadership and interaction in the ambulatory, institutional, professional, legislative, and regulatory health care setting.

MHP 3201 Biometrics 2 Q.H.

Statistical methods applied to biomedical samples and analysis of biomedical research data. *Prereq.: None.*

MHP 3401 Health Policy Analysis and Evaluation 3 Q.H.

Principles of policy analysis applied to health care issues and institutions. Mechanisms of regulatory and economic incentives and constraints will be examined. Applications of benefit-cost and cost-effectiveness analysis to the evaluation of health programs.

MHP 3402 Health Policy Seminar I 1 Q.H.

Analysis of recent health policy literature. Students will be expected to evaluate and critique published articles and lead a seminar session.

MHP 3403 Health Policy Seminar II 1 Q.H.

Continuation of Health Policy Seminar I.

MHP 3404 Health Policy Seminar III 1 Q.H.

Continuation of Health Policy Seminar II.

MLS 3301 Functions of the Human Systems 2 Q.H.

Physiology of the nervous, endocrine, muscular, cardiovascular, respiratory, urogenital and digestive systems. *Prereq.: Chemistry, biology.*

MLS 3302 Pathophysiology I 2 Q.H.

Disease processes as appropriate and inappropriate variants of normal physiological functions. A detailed examination of certain important and illustrative diseases rather than a survey or catalogue of diseases in general. *Prereq.: Mammalian physiology; knowledge of biochemistry is helpful.*

MLS 3303 Pathophysiology II 2 Q.H.

A continuation of MLS 3302 Pathophysiology I. *Prereq.: MLS 3302.*

MLS 3304 Cellular Pathology 3 Q.H.

Topics include cell aging and cell death mechanisms; reactions of cells to injury; the effects of ischemia, oxides of nitrogen, ozone, carbon tetrachloride, mercury, cadmium and polyhalogenated aromatic compounds; storage diseases; immune injury and theories of carcinogenesis. Lectures are

based on recent review and current research articles. *Prereq.: Chemistry, biology; biochemistry and cell biology helpful.*

MLS 3310 Principles of Medical Endocrinology 2 Q.H.

Endocrine-related clinical abnormalities with emphasis placed on the relationship of clinical laboratory measurement to biochemical dysfunctions of the endocrine system. *Prereq.: Biochemistry.*

MLS 3321 Hematology I—Disorders of the Erythrocytes 2 Q.H.

A detailed examination of the physiology and pathology of red blood cells and hemoglobin. *Prereq.: Some knowledge of basic hematology is essential, and familiarity with general mammalian biochemistry is strongly recommended.*

MLS 3322 Hematology II—Disorders of the Leukocytes 2 Q.H.

The pathophysiology of white cell disorders. Clinical and laboratory correlations of leukemias, myeloproliferative and lymphoproliferative disorders, infections, and inherited leukocyte anomalies. *Prereq.: Undergraduate biochemistry.*

MLS 3323 Hematology III—Hemostasis 2 Q.H.

Clinical and laboratory correlations of hemostatic disorders are presented. Starting with the basics, material is covered up to the most recent experimentation, technical and clinical applications. *Prereq.: Undergraduate biochemistry, hematology course or experience.*

MLS 3331 Genetic and Immunologic Aspects of Blood Group Identification 1 Q.H.

Lectures dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.: MLS 1631 and permission of instructor.*

MLS 3332 Principles and Foundations of the Blood Group Systems 2 Q.H.

Lectures and experience with the human blood group systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.: MLS 3331, MLS 3531 and permission of the instructor.*

MLS 3333 The Design and Problems of Compatibility Testing 1 Q.H.

Lectures and experience with the design and purpose of compatibility testing; factors complicating compatibility procedure; techniques employed in compatibility testing; leukocyte, platelet, and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center.

Prereq.: MLS 3331, MLS 3531, MLS 3332, MLS 3532 and permission of the instructor.

MLS 3334 Principles of Hematology and Coagulation Related to Transfusion 3 Q.H.

Lectures and laboratory experience dealing with: hemoglobins; iron metabolism; blood formation; blood volume functions of circulating cells; anemias; leukemias and lymphomas; coagulation theories, factors, and disorders. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.: Permission of the instructor.*

MLS 3335 Transfusion Therapy 2 Q.H.

Lectures dealing with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, physical characteristics of stored blood, indications for transfusion, transfusion reaction, therapeutic phlebotomy and pheresis, autologous transfusions, pediatric transfusions, massive blood replacement, extracorporeal perfusion, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.: MLS 1631 and permission of instructor.*

MLS 3336 Immunochemistry 2 Q.H.

Lectures and experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design of physical facilities; evaluation, selection and maintenance of equipment; evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; operations of donor facilities and blood bank laboratories. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.: MLS 1631 and permission of instructor.*

MLS 3338 Immunobiology 2 Q.H.

Topics of current interest in immunobiology, such as organ transplantation, immune tolerance, autoimmune diseases, and the immunology of cancer. *Prereq.: Consent of instructor.*

MLS 3339 Immunopathology 2 Q.H.

The course presents the basic elements for the understanding of clinical immunology and immunopathology. Following a brief review of the components and function of the immune system, the material covered will take into account the current literature relating to the disorders of the complement system, the biologic mechanisms of immunologically induced tissue injury (hypersensitivity reactions), the classification and characterization of immunodeficiency states, (including acquired immunodeficiency syndrome—AIDS), the modes of induction and

diagnostic categorization of autoimmune disorders and the immunological features of cancer. *Prereq.: MLS 3338.*

MLS 3341 Advanced Clinical Microbiology I **3 Q.H.**

This course focuses on those aspects of clinical microbiology that are of significance in the understanding of the infectious process, its diagnosis and chemotherapy. It emphasizes the mechanisms of disease production, host defenses, and characteristics of infectious agents that contribute to the diagnosis. Specific topics include infections of the upper respiratory tract, bacterial endocarditis, infectious diarrhea and anaerobic infections, sexually transmitted diseases, nosocomial infections, and basic principles of antimicrobial susceptibility testing.

MLS 3342 Advanced Clinical Microbiology II **3 Q.H.**

Major emphasis of this course is on current topics in infectious diseases. Specific discussions include autoimmune disease syndrome, antibiotic-induced diarrhea, toxic shock syndrome, legionellosis, rapid methods of diagnosis and problems associated with antimicrobial susceptibility testing (tolerance synergism, antagonism, and determination of drug levels in body fluids). *Prereq.: MLS 3341.*

MLS 3345 Epidemiology **2 Q.H.**

Basic concepts of epidemiology, causes of disease, factors contributed by agents, the human host, and the environment. Acquisition and evaluation of data. Relationship of person, time, and place. Case studies and problems. *Prereq.: Consent of instructor.*

MLS 3351 Interpretive Clinical Chemistry **2 Q.H.**

Discussions of variables affecting results to be considered when interpreting patient chemistry values. This knowledge is pertinent to the laboratorian in determining the validity of performing a particular assay on a specimen collected or stored under certain conditions as well as determining the feasibility of obtained results for particular patient conditions. The course also includes the typical value patterns seen in various pathological conditions to provide background material on frequently encountered pathological variation. *Prereq.: Biochemistry and clinical laboratory experience.*

MLS 3352 Clinical Chemistry I **2 Q.H.**

Instrumental methods/automation, analytical goals applied to method selection and evaluation, reference ranges, quality control, amino acids/proteins, carbohydrates, lipids and electrolytes/blood gases and acid base.

MLS 3353 Clinical Chemistry II **2 Q.H.**

Diagnostic enzymology, diagnostic endocrinology, renal function, liver function, GI and pancreas, hemoglobin/ion/porphyrins, therapeutic drug monitoring, pregnancy/fetal function and tumor markers.

MLS 3354 Biomedical Analysis **2 Q.H.**

The modern reagents and techniques important in purifying, quantifying and controlling biomolecules are presented. Examples of reagents are, radioisotopes, lumiphores, fluorophores, enzymes, electrophores, monoclonal antibodies, DNA probes, protein A, avidin-biotin, and detergents. Examples of techniques are chromatography, including macromolecule HPLC, 2D-electrophoresis, radioenzymatic assays, immunoassays, antibody kinetics, blotting assays, biosensors, flow injection analysis, and chemical modification of macromolecules. *Prereq.: INT 3101-3.*

MLS 3355, MLS 3356 Seminar and Report in Clinical Chemistry I, II **2 Q.H.**

Reports and discussions of current journal articles in clinical chemistry. *Prereq.: PMC 3301.*

MLS 3361 Health Science Education I **3 Q.H.**

An overview of various aspects of education in the health-related professions to include: design and use of behavioral objectives; evaluation tools (both clinical and didactic); and a survey of various teaching methods. Current journal literature will supplement lecture material. *Prereq.: Health Professions major.*

MLS 3362 Health Science Education II **3 Q.H.**

Various types of learning packages or self-instructional aids are examined. With the aid of lecture material and independent assignment, each student will design and produce a 15-minute autotutorial and will present it to the class for critique. Current journal literature will also be used. *Prereq.: MLS 3361.*

MLS 3365 Medical Laboratory Management I **3 Q.H.**

This course was developed to provide an opportunity for medical technologists to prepare themselves for managerial responsibilities. Participants are introduced to basic skills and knowledge appropriate to the administration of a medical laboratory rather than specialized functional techniques. The basic objectives of the concentration are: to confront the student with appropriate learning experiences; to increase skills and knowledge in basic disciplines underlying administrative practice; and to develop judgment and skills in problem analysis and decision making in organizations. Major topics to be discussed include supervision; operations; organizations; productivity; human behavior; communications; personnel management. *Prereq.: Medical laboratory experience or consent of instructor.*

MLS 3531 Genetic and Immunologic Aspects of Blood Group Identification Laboratory **1 Q.H.**

Laboratory experience dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the

New England Deaconess Hospital Blood Bank Training Center. *Prereq.*: *MLS 1631 and permission of instructor.*

MLS 3532 Principles and Foundations of the Blood Group Systems Laboratory 2 Q.H.

Laboratory experiences with the human blood systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.*: *MLS 3331, MLS 3531 and permission of the instructor.*

MLS 3533 The Design and Problems of Compatibility Testing Laboratory 2 Q.H.

Laboratory experience with the design and purpose of compatibility testing; factors complicating compatibility procedures; techniques employed in compatibility testing; leukocyte, platelet and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.*: *MLS 3331, MLS 3531, MLS 3332, MLS 3532 and permission of the instructor.*

MLS 3535 Transfusion Therapy Laboratory 2 Q.H.

Laboratory experience with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, physical characteristics of stored blood, indications for transfusion, transfusion reactions, therapeutic phlebotomy and pheresis, autologous transfusions, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.*: *MLS 1631 and permission of instructor.*

MLS 3536 Immunohematology Administration Laboratory 2 Q.H.

Laboratory experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design and physical facilities; evaluation, selection, and maintenance of equipment; evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; operations of donor facilities; and blood bank laboratories. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.*: *MLS 1631 and permission of instructor.*

MLS 3538 Immunobiology Laboratory 2 Q.H.
Students are required to undertake individual research projects relating to topics covered in lecture. *Prereq.*: *None.*

MLS 3602 Blood Banking—MLS Seminar 1 Q.H.
Revolving topics. *Prereq.*: *None.*

MLS 3603 Clinical Chemistry—MLS Seminar 1 Q.H.
Revolving topics. *Prereq.*: *None.*

MLS 3604 Hematology—MLS Seminar 1 Q.H.
Revolving topics. *Prereq.*: *None.*

MLS 3605 Immunology—MLS Seminar 1 Q.H.
Revolving topics. *Prereq.*: *None.*

MLS 3606 Management—MLS Seminar 1 Q.H.
Revolving topics. *Prereq.*: *None.*

MLS 3607 Microbiology—MLS Seminar 1 Q.H.
Revolving topics. *Prereq.*: *None.*

MLS 3801 Graduate Research Report I 2 Q.H.
Research of a special topic in medical laboratory science, involving individual research, is undertaken and reported under the direction of a faculty member. *Prereq.*: *Written permission of instructor.*

MLS 3802 Graduate Research Report II 2 Q.H.
Students may register twice (4 Q.H.). Continuation of MLS 3801. *Prereq.*: *MLS 3801.*

MLS 3821 MLS Thesis 2 Q.H.
Students may register three times (6 Q.H.). *Prereq.*: *Written permission of instructor.*

PA 3101 Clinical Neurology 4 Q.H.
Clinical application of neuroanatomy and neurophysiology. Students will have the opportunity to develop an understanding of the normal functioning of the nervous system as well as to develop a clinical approach to the assessment management of a variety of nervous system disorders and disease states. *Prereq.*: *PA 1125, PA 1139.*

PA 3102 Principles of Electrocardiography 4 Q.H.
Principles of electrophysiology and its application to electrocardiographic tracing. Students receive instruction in recognizing arrhythmias, rate and axis determination, conduction abnormalities, characteristic changes seen in myocardial infarction, and ischemia, as well as drug and metabolic effect manifested on the electrocardiogram. *Prereq.*: *PA 1136, PA 1337, PA 1125, PA 1139.*

PA 3103 Rehabilitation Medicine 4 Q.H.
Techniques of effective planning and decision making for patients with multiple chronic problems. The purposes, techniques, and potential of rehabilitation medicine are also discussed. *Prereq.*: *PA 1336, PA 1337, PA 1338, PA 1358.*

PAH 3101 Principles of Medicine I 6 Q.H.
An intensive, three-academic quarter, organ-system based sequence encompassing anatomy, physiology, pathophysiology, and therapy of disease. (This course is the major component of the second-year curriculum of the Tufts School of Medicine and meets for approximately eighteen hours/week). *Prereq.*: *Admission to Pharm.D. Program.*

PAH 3102 Principles of Medicine II 6 Q.H.
Continuation of PAH 3101. *Prereq.: PAH 3101.*

PAH 3103 Principles of Medicine III 6 Q.H.
Continuation of PAH 3102. *Prereq.: PAH 3102.*

PAH 3201 Drug Literature Evaluation 2 Q.H.
Principles and practice of drug information, literature retrieval, and evaluation of the pharmacy and medical literature. *Prereq.: Admission to Pharm.D. program.*

PAH 3211, PAH 3212, and PAH 3213 Pharmacotherapeutics I, II, III 2 Q.H. each
A three-quarter sequence in advanced contemporary therapeutics of disease. Topics parallel material presented in Principles of Medicine sequence. *Prereq.: Admission to Pharm.D. program.*

PAH 3221 Psychosocial Aspects of Health Care—Seminar 1 Q.H.
Psychological and social concerns that determine patient behavior and impact on health care. *Prereq.: Admission to Pharm.D. program.*

PAH 3231 Pharmacokinetics in Drug Therapy 3 Q.H.
The application of basic and practical clinical pharmacokinetic techniques to patient care. Topics parallel material presented in Principles of Medicine sequence. *Prereq.: Admission to Pharm.D. program.*

PAH 3301 Introductory Clerkship I 1 Q.H.
Initial assignment to clinical site. Student rotates through the various clinical laboratories to obtain working knowledge of the role of the clinical laboratory and the data it generates in the management of disease. Emphasis in microbiology, clinical chemistry and hematology areas. Meets approximately four hours/week. *Prereq.: Admission to Pharm.D. program.*

PAH 3311, PAH 3312, PAH 3313, PAH 3314 Clerkship I, II, III, IV 4 Q.H., 5 Q.H., 5 Q.H., 5 Q.H.

A four-quarter sequence of advanced clinical clerkship rotations in patient care at various affiliated clinical sites. Students participate in "rounding" activities with medical and other health professionals and have the opportunity to provide drug information in the therapeutic decision-making process. The emphasis in these rotations is on helping students develop skills and familiarity with the application of drugs in the clinical setting as well as the usual progression of disease. Rotations include internal medicine, ambulatory care, and elective experiences. Involves approximately 40 hrs/week. *Prereq.: Admission to Pharm.D. program.*

PAH 3321 Patient Assessment 2 Q.H.
General principles of history taking and physical examination. Emphasis is on organ systems of particular importance to the clinical pharmacist in monitoring drug response. *Prereq.: Admission to Pharm.D. program.*

PAH 3601, PAH 3602 Seminar I, II 1 Q.H. each
A two-quarter sequence covering topics of relevance to the clinical pharmacy practitioner. Principles of effective communication and teaching are discussed. Students are expected to make oral presentations covering various therapeutic and related subjects as well as the progress of their investigational projects. *Prereq.: Admission to the Pharm.D. program.*

PAH 3707 Experimental Design and Biometrics 3 Q.H.
Fundamental principles of experimental design and data analysis; particular emphasis on applications to biomedical sciences. Topics include descriptive statistics, hypothesis testing, analysis of variance, correlation, regression, and nonparametric methods.

PAH 3801, PAH 3802 Investigational Project I, II 2 Q.H. each
Students have the opportunity to demonstrate their ability to identify a problem within the domain of clinical pharmacy, formulate a hypothesis, develop methods to collect and interpret the data in order to test the hypothesis, and report the investigation in writing using a thesis format. (Note "Investigational Component of Pharm.D. Program.") *Prereq.: Admission to Pharm.D. program.*

PAH 3803 Investigational Project Continuation 1 Q.H.
Prereq.: PAH 3802.

PCL 3101 Concepts in Pharmacology 2 Q.H.
In-depth coverage of the fundamental principles of pharmacology. The course covers pharmacodynamics, including dose-effect relationships and drug-receptor interactions. Pharmacokinetic concepts, including absorption, distribution, and elimination will be presented as well as common pathways of drug metabolism. Other topics to be discussed include pharmacogenetics, drug resistance, tolerance, and physical dependence. An overview of experimental and clinical drug evaluation in humans will be presented. The course is intended as a necessary prerequisite for succeeding courses in pharmacology and toxicology. *Prereq.: Admission to a graduate department or approval of the instructor.*

PCL 3121 Experimental Pharmacology 2 Q.H.
A laboratory course in experimental pharmacology involving whole animal, isolated tissues and drug receptors to demonstrate classical research methodologies. *Prereq.: PCL 3101, PCL 3153, and admission to Pharmacology or Toxicology programs, or Consent of Pharmacology Program Director.*

PCL 3131 Receptor Pharmacology 2 Q.H.
Receptors for drug substances and for endogenous ligands are reviewed in a format that combines lecture presentations and discussion. Considerable emphasis is placed on the evaluation of current literature. The course covers: techniques available to study receptors; various models for receptor-ligand interaction; stereochemical aspects of receptor

interactions; receptor-mediated coupling mechanisms; evaluation of several specific receptor systems. *Prereq.: MLS 3301, PCL 3101, INT 3101, INT 3102, INT 3103 or permission of the instructor.*

PCL 3141 Pharmacology of Drug Dependence **2 Q.H.**

An intensive survey of the major drug classes subject to misuse and addiction. Lectures emphasize general concepts of tolerance and dependence, the general pharmacology of prototypes of abused drugs, patterns and consequences of abuse in humans, and recent research advances. Selected research papers are critically examined to stimulate quantitative pharmacologic thinking. *Prereq.: PCL 3101.*

PCL 3153 Pharmacological Basis of Therapeutics I **2 Q.H.**

A detailed survey of the chemical and pharmacological basis of the major classes and the following characteristics of a prototype agent from each class: indication; adverse reactions; contraindications; structure-activity relationship; metabolism; mechanics of action; clinically significant. Reading assignments cover animal models relevant to therapeutic screening and/or testing and the appropriate design of clinical trials. *Prereq.: PCL 3101.*

PCL 3154 Pharmacological Basis of Therapeutics II **2 Q.H.**

Continuation of PCL 3153. *Prereq.: PCL 3153.*

PCL 3155 Pharmacological Basis of Therapeutics III **2 Q.H.**

Continuation of PCL 3154. *Prereq.: PCL 3154.*

PCL 3301 Pathology **2 Q.H.**

The student is introduced to the study of the nature of disease, emphasizing the general mechanisms and pathogenesis. Of paramount importance is the effect of disease on the human body. The language of disease is stressed. Basic principles of disease processes and more common special diseases are extensively covered. A research paper may be assigned at the discretion of the instructor. *Prereq.: anatomy and physiology.*

PCL 3601 Pharmacology Seminar **1 Q.H.**

Prereq.: PCL 3101.

PCL 3801 Pharmacologic Methods I **3 Q.H.**

Students carry out experiments in the laboratory of a pharmacology or toxicology faculty member. The experiments serve to demonstrate the techniques utilized in that lab to study a pharmacologic question. *Prereq.: Ph.D. students only.*

PCL 3802 Pharmacologic Methods II **3 Q.H.**

Continuation of PCL 3801. *Prereq.: PCL 3801.*

PCL 3811 Research Report in Pharmacology I **2 Q.H.**

A selected research project is undertaken by the student under the direction of a faculty member. *Prereq.: PCL 3101.*

PCL 3812 Research Report in Pharmacology II **2 Q.H.**

A continuation of PCL 3811. *Prereq.: PCL 3811.*

PCL 3821 Pharmacology Thesis **2 Q.H.**

Students may register three times (6 Q.H.). *Prereq. Written permission from Program Director.*

PCT 3101 Introduction to Biopharmaceutics and Pharmacokinetics **3 Q.H.**

A course designed primarily to allow students to remedy deficiencies in biopharmaceutics and pharmacokinetics. Topics include general concepts of one and two compartment models; linear and nonlinear pharmacokinetics; drug kinetics after intravenous, intramuscular, or oral administration; practical methods of compartmental models utilizing plasma and/or urinary data; multiple dosing kinetics; bioavailability and bioequivalence of drug products; and effect of renal impairment on drug kinetics. *Prereq.: Permission of instructor.*

PCT 3111 Clinical Pharmacokinetics **2 Q.H.**

Emphasis is placed upon applying various pharmacokinetic techniques to estimating dosage regimens, evaluating drug therapy, consulting on drug selection, and assessing bioavailability and bioequivalence data. *Prereq.: A background in biopharmaceutics or consent of instructor.*

PCT 3112 Pharmacokinetics **3 Q.H.**

A class designed to acquaint graduate students with the theoretical compartmental analysis in pharmacokinetics. Topics include derivation and treatment of general equations for linear and nonlinear mammillary models. Use of Laplace transform, transfer functions, general partial fraction theorem, and input-disposition functions in pharmacokinetics. Practical methods used to kinetically analyze the absorption, distribution, and elimination of drugs are emphasized. Computer methods, physiological models, and stochastic compartmental systems are explored. *Prereq.: MTH 1245, MTH 1246, graduate standing and permission of instructor.*

PCT 3161 Drug Metabolism **2 Q.H.**

Presentation of the current principles and methods for studying the metabolic transformation and physiological disposition of drugs and other chemicals of pharmacological and toxicological interest. The chemistry of Phase I and Phase II reactions from a mechanistic and empirical viewpoint is covered. The role of structure, bonding, molecular configuration, substitution, and related physiochemical factors in the enzymatic reaction is assessed. The effects of enzyme induction and other factors in the enzymatic reaction is assessed. The effects of enzyme induction and other factors such as species, sex, and age on the extent of metabolism are explored. *Prereq.: PCL 3010 or permission of instructor.*

PCT 3200 Advanced Pharmaceutics **2 Q.H.**

An in-depth study of the theoretical principles of modern physical pharmacy. Emphasis is on physical

insight and mathematical rigour. Topics include application of basic principles of thermodynamics, collegative properties, colloidal systems, molecular and micellar association, surface chemistry, mass transport phenomena and chemical stability of drugs. *Prereq.: PCT 1340, PCT 1350 or consent.*

PHP 3101 Hospital Pharmacy Administration I 3 Q.H.

Management of a department's personnel and financial resources. Management skills, personnel administration and organization are covered, as well as budget preparation, analysis and control, and hospital reimbursement.

PHP 3102 Hospital Pharmacy Administration II 3 Q.H.

An overview of hospital pharmacy services and an introduction of areas of the hospital that either require or relate to pharmacy services. Hospital administration, materials management, quality assurance programs, committee responsibilities, and drug distribution systems are discussed, as is the development and writing of a proposal for new services.

PHP 3121 Health Care Administration I 3 Q.H.

The socioeconomics and statistics of health care, including governmental programs, legislative trends, third-party insurance and welfare programs, and other areas that may affect the management of the modern institutional pharmacy. *Prereq.: Admission to the hospital pharmacy program or consent of instructor.*

PHP 3131 Computer Applications in Hospital Pharmacy 3 Q.H.

An extensive review of past, present and future applications of computer systems in institutional practice. Management aspects of computer systems development and selection are covered. Discussion of microcomputers and departmental computers to support clinical and management practice.

PHP 3141 Legal Aspects/Federal Legislation in Pharmacy 2 Q.H.

An analysis of the federal and state laws relating to the distribution of drugs in the institution. Included are common-law liabilities such as malpractice and other frequently encountered problems. *Prereq.: Admission to hospital pharmacy program.*

PHP 3165 Special Topics in Hospital Pharmacy 2 Q.H.

Selected topics of interest to pharmacy or the health community in general.

PHP 3201 Clinical Pharmacy 3 Q.H.

The patient-oriented aspects of the application of therapeutic agents to hospital patients. An in-depth study of the relation of therapeutic regimens to laboratory tests and drug interactions. The role of the hospital pharmacist as an active member of the health-care team dealing directly with inpatients and outpatients. *Prereq.: Admission to hospital pharmacy program or consent of instructor.*

PHP 3211 Contemporary Therapeutics I 3 Q.H.

Recent developments in current therapeutic approaches and their rationale in the treatment of cardiovascular, neurological, gastrointestinal, musculoskeletal, and metabolic diseases of a noninfectious nature. Therapy related to aging and selected genetic diseases. *Prereq.: PHP 3201.*

PHP 3212 Contemporary Therapeutics II 3 Q.H.

Current concepts of infectious diseases and the rationale for the chemotherapeutic treatment of these conditions. Diseases of the blood and blood-forming organs, neoplastic disease, and diseases related to deficiency states. *Prereq.: PHP 3201.*

PHP 3231 Drug Monitoring 3 Q.H.

The process by which drugs are monitored to determine their effectiveness, safety, prevention of iatrogenic factors, drug-drug interactions, and matters affecting patient compliance with a therapeutic regimen. The utilization of this information in improving patient care. *Prereq.: PHP 3201.*

PHP 3241 Sterile Products 3 Q.H.

Theory principles, methods, and techniques in preparing sterile, pyrogen- and particulate-free products. Equipment and laboratory design required for manufacturing different types of sterile products and the practical considerations essential for their production. *Prereq.: Permission of instructor.*

PHP 3601 Seminar on Hospital Pharmacy 3 Q.H.

Seminar on current developments or specific problems in hospital pharmacy that have been studied in-depth by students with guidance from the graduate faculty. The student presentations may be alternated with guest speakers on topics of current interest. Student participation in the discussions is an essential objective of the course. *Prereq.: Admission to hospital pharmacy program.*

PHP 3801 Hospital Pharmacy Thesis 2 Q.H.

Students may register three times (6 Q.H.). *Prereq.: Written permission of instructor.*

PMC 3101 Chemistry of CNS Depressants 3 Q.H.

Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, antiepileptics, analgesics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification is undertaken. *Prereq.: PMC 3105 or permission of instructor.*

PMC 3102 Chemistry of Autonomic Drugs 3 Q.H.

A discussion of drugs acting on the central nervous system, with special emphasis on the action mechanism of the chemical mediators of the peripheral nervous system. The role of the agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems—is discussed in relation to their chemical structure and

biological activity. *Prereq.: PMC 3105 or permission of instructor.*

PMC 3103 Chemistry of Anti-infectives 3 Q.H.

A study of various chemotherapeutic agents employed in the treatment of infectious diseases. Included are: the sulfonamides, antibiotics, antivirals; antitubercular, antifungal, and antimalarial agents. Special emphasis is on structure-activity relationships, mechanisms of action, and modern research in each area. *Prereq.: PMC 3105 or permission of instructor.*

PMC 3104 Biochemical and Pharmacological Principles of Cancer Chemotherapy 3 Q.H.

Recent developments in new approaches to the treatment of cancer are emphasized, including alkylating agents, anti-metabolites, hormones, miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of chemotherapeutic action are explored. *Prereq.: PMC 3105 or permission of instructor.*

PMC 3105 Principles of Medicinal Chemistry 3 Q.H.

This course presents basic underlying chemical principles which account for the properties of drugs and an understanding of drug action. Among the principles relating biologic activity to molecular structure that will be discussed are stereochemical properties of the molecules, the ionization constants, the aqueous and lipid solubility, the ability of the molecules to hydrogen bond, and the ability of molecules to assume different structural conformations on forming these bonds. *Prereq.: Biochemistry and organic chemistry.*

PMC 3171 Heterocyclic Drugs in Medicinal Chemistry 3 Q.H.

The application of the combined principles of medicinal and heterocyclic chemistry to the synthesis of pharmaceutically useful compounds. The emphasis of the material presented will be upon a critical evaluation of the literature methods with respect to synthesis and biological activity. *Prereq.: Advanced Organic Chemistry I or permission of instructor.*

PMC 3501 Identification and Isolation of Natural Products and Organic Medicinals 4 Q.H.

A laboratory course in the identification of various types of plant constituents that have medicinal/pharmaceutical use, and the isolation and characterization of known and/or unknown chemical compounds from selected plant samples. *Prereq.: At least one year of organic chemistry and some background in plant chemistry, e.g., PMC 1440 or by permission of instructor.*

PMC 3511 Advanced Drug Synthesis 4 Q.H.

Application of synthetic and analytical techniques to the formation of new drugs. *Prereq.: Two quarters of organic chemistry with laboratory.*

PMC 3601 Medicinal Chemistry Seminar 1 Q.H.
Reports and discussions involving current journal articles and research in medicinal chemistry. *Prereq.: PMC 3101.*

PMC 3643 Biomedical Science Research Report I 2 Q.H.

Students will be required to present and participate in research group related seminars. The format for these presentations will be determined by the student's adviser.

PMC 3644 Biomedical Science Research Report II 2 Q.H.

Continuation of PMC 3643.

PMC 3645 Biomedical Science Research Report III 2 Q.H.

Continuation of PMC 3644.

PMC 3646 Biomedical Science Research Report IV 2 Q.H.

Continuation of PMC 3645.

PMC 3647 Biomedical Science Research Report V 2 Q.H.

Continuation of PMC 3646.

PMC 3648 Colloquium Presentation 1 Q.H.

Doctoral students will be required to present one formal seminar on their research. This presentation will be open to all interested individuals.

PMC 3799 Doctoral Dissertation Continuation 0 Q.H.

Continuation of PMC 3813 Doctoral Dissertation which must be taken three times before registering for this course. *Prereq.: PMC 3813.*

PMC 3813 Doctoral Dissertation 3 Q.H.

Prereq.: Written Permission of Instructor.

RSC 3101 Nuclear Medicine I: Instrumentation 3 Q.H.

An introduction to nuclear detection techniques by both lecture and laboratory demonstration. Various systems are considered, including scintillation, ionization, gas, and solid-state detectors. Basic principles of spectrometry with an emphasis on sodium iodide detectors will be studied. *Prereq.: PHY 3401.*

RSC 3102 Nuclear Medicine II: Instrumentation 3 Q.H.

A study of the application of nuclear detection techniques in the physical aspects of nuclear medicine. Current clinical instrumentation including gamma cameras and scanners, probes, and whole body counters, as well as future developments such as the solid-state and the multiwire proportional cameras, and positron and tomographic imaging devices. Principles of collimation are studied with each system. The application of computers in nuclear medicine. This course includes both lecture and laboratory demonstration and is a companion course to RSC 3101. *Prereq.: PHY 3401 and RSC 3101.*

RSC 3104 Nuclear Medicine: Radiopharmaceutical Laboratory 2 Q.H.

Demonstrations and discussions of the preparation and quality control of radiopharmaceuticals derived from reactor, accelerator, and generator-produced radionuclides. Assay techniques for radiochemical, radionuclide, and chemical purity. Regulatory implications in the handling and dispensing of radioactive drugs. *Prereq.: RSC 3102.*

RSC 3131 Clinical Aspects of Nuclear Medicine 2 Q.H.

The current practice of diagnostic nuclear medicine in large medical centers and small community hospitals. The effect of pathology in the distribution of radiopharmaceuticals will be considered on an organ and disease basis and illustrated with actual patient findings. The techniques employed in imaging the various organs and body compartments will be presented. Factors influencing the decision to perform a diagnostic nuclear medicine procedure and the choice of the agent to be employed will be discussed. *Prereq.: RSC 3102.*

RSC 3201 Radiopharmaceutical Chemistry 3 Q.H.

This course discusses the application of chemistry to the design and synthesis of radiodiagnostic agents. The properties of the radionuclides and their biological carriers as they relate to their uses in nuclear medicine will be presented. *Prereq.: PMC 3105 or permission of instructor.*

RSC 3811 Radiopharmaceutical Chemistry Research Report I 2 Q.H.

A selected research project is undertaken by the student under the direction of a faculty member. *Prereq.: Written permission of instructor.*

TOX 3101 Concepts in Toxicology I 3 Q.H.

An overview of toxicology describing the elements of method and approach that identify the science. Special emphasis is placed on the systemic site of action of toxicants. The intent of this part of the course is to help provide answers to two questions: 1) What kinds of injury are produced in specific organs or systems by toxic agents? 2) What are the agents that produce these effects? *Prereq.: PCL 3101.*

TOX 3102 Concepts in Toxicology II 3 Q.H.

Continuation of Concepts in Toxicology I. *Prereq.: TOX 3101.*

TOX 3121 Environmental Toxicology 3 Q.H.

The problems of toxic disturbances and distortions of our biosphere are discussed. When appropriate, the mechanism of action of toxic agents and the basis of their selectivity will be examined. Toxic agents are grouped by chemical or use characteristics such as pesticides, food additives, metals, social poisons, chemical carcinogens, teratogens, and mutagens. This course will attempt to provide perspective for the nontoxicologist to the application of the results of toxicologic investigation and a better understanding of those chemicals which, in ever-increasing amounts, threaten health, comfort, or quality of life. *Prereq.: Admission to a graduate department or approval of the instructor.*

TOX 3501 Toxicology Lab 4 Q.H.

Companion to the undergraduate course TOX 1320 Toxicology Lab. In addition to the lab work for TOX 1320, graduate students are expected to complete special projects assigned by their adviser. *Prereq.: Permission of instructor.*

Physician Assistants

The Physician Assistants is a post-baccalaureate certificate program. Those interested in enrolling must get the permission of the director of the Physician Assistant Program.

MLS 1109 Foundations of Medical Laboratory Science 3 Q.H.

Basic laboratory methods employed in primary care, including urinalysis, gram staining, hematocrit, hemoglobin, sedimentation rate, white-cell count, and differential. Laboratory practice is included. *Prereq.: PA students only.*

PA 1120 Roles, Rules, and Resources for Physician Assistants 2 Q.H.

The role of physician assistants, including the manner in which they interact with other health professionals, as well as the way in which their role is perceived by others. This course is also organized to help students gain an understanding of the law as it relates to physician assistants' actions and to help them develop the ability to make referrals to common community resources.

PA 1125 Human Anatomy 2 Q.H.

The basic structure of the human body, highlighting those features which are of clinical importance. Emphasis is on the gastrointestinal, cardiovascular, respiratory, neurological, and musculoskeletal systems.

PA 1134 Physical Diagnosis 5 Q.H.

Techniques of obtaining and presenting an accurate history; performing a competent and thorough physical examination; and synthesizing the results of the history, physical, and laboratory findings to arrive at an accurate evaluation of the patient. Discussion, demonstrations, and patient workups are used to assist students in building these skills.

PA 1139 Medical Physiology 6 Q.H.

A systematic approach to human physiology, offering in-depth study of gastrointestinal function,

respiratory mechanics, endocrine function, cardiovascular dynamics, and renal and electrolyte function.

PA 1321 Patient Education and Counseling 2 Q.H.

An opportunity to acquire the knowledge necessary for educating and counseling patients. Course materials include a demonstration of ways in which to evaluate patients' needs and readiness to learn, as well as the use of common teaching techniques for issues such as chronic disease management, osteomies, diabetes, heart disease, nutrition counseling, and sex education. *Prereq.: PA 1335.*

PA 1322 Medical Care and Current Social Problems 2 Q.H.

The principal components of the health care delivery system, with emphasis on services, organization, and funding. Selected social problems are used to demonstrate the operation of the medical care system.

PA 1323 Principles and Concepts of Emergency Medicine 3 Q.H.

An introduction to the principles of life-support techniques. Emphasis is placed on the initial management of acute medical and traumatic conditions in hospital and prehospital situations. Students are instructed in basic cardiopulmonary resuscitation techniques. *Prereq.: Successful completion of Quarter I of the physician assistant program.*

PA 1324 Clinical Nutrition 3 Q.H.

The physiological function of essential nutrients; the need for individual nutrients and their food sources; food fads and food additives; the role of nutrition in heart disease, diabetes, common gastrointestinal disorders, obesity, and hypertension.

PA 1335 Principles of Interviewing 2 Q.H.

Various methods of interviewing patients. Emphasis is placed on establishing a relationship and understanding the effects of cultural background and psychosocial problems on the patient's response to illness, goal setting, personality types, and death and dying.

PA 1336 Pathophysiology and Medicine I 3 Q.H.

A systems approach to the principles of disease processes in people. Topics include physiology, pathophysiology, the natural history of disease, diagnostic procedure, and therapeutic measures. Hematology and cardiology problems are usually covered in this portion of the course.

PA 1337 Pathophysiology and Medicine II 3 Q.H.

Continuation of course from previous quarter. Pulmonary, gastroenterology, immunology, and rheumatology problems are usually covered in this portion of the course. *Prereq.: PA 1336, PA 1125, PA 1139.*

PA 1338 Pathophysiology and Medicine III 3 Q.H.

Continuation of course from previous quarter. Renal, endocrine, oncology, infectious disease, and sexually transmitted disease problems are usually covered

in this portion of the course. *Prereq.: PA 1336, PA 1337, PA 1125, PA 1139.*

PA 1340 Introduction to Clinical Rotations 4 Q.H.

Clinical rotations, expectations, and requirements for students about to enter their clinical year. Some review of history taking and physical examination skills is conducted, and students are instructed in various clinical procedures.

PA 1341 Applied Study in Emergency Medicine 4 Q.H.

During this rotation, the student has the opportunity to become familiar with the problems encountered in an emergency room. The student is responsible for taking medical histories and performing physical examinations on acute as well as nonemergent patients and presenting these to the medical preceptor. When appropriate, the necessary diagnostic and therapeutic measures are taken. Through didactic sessions at the clinical site as well as clinical training, the student may also be exposed to the emergency management and treatment of conditions such as trauma, shock, burns, asthma, poisoning, allergic reactions, seizures, and respiratory failure. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1342 Applied Study in Medicine 4 Q.H.

During this in-hospital rotation, the student is given the opportunity to take and record histories and perform physical examinations. Attending medical rounds and conferences, performing diagnostic procedures, presenting case write-ups, recording progress notes, and working under the supervision of a doctor of medicine provide the opportunity to become versed in the assessment and management of a variety of medical problems. Emphasis is placed on the skills of collecting, assessing, and presenting patient data for physician review; ordering appropriate laboratory and diagnostic studies; counseling patients in therapeutic procedures; and helping to coordinate the contributions of other health professionals in the management of the patient. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1343 Applied Study in Pediatrics 4 Q.H.

During the pediatric rotation, the student may develop familiarity with outpatient pediatric problems through training in clinics and private pediatric offices. Emphasis during this training is on caring for the child from birth through adolescence. Students are given the opportunity to take histories and perform pediatric physical examinations. Diagnosis and management of common childhood illnesses and evaluation of the variations of growth and development are also stressed. Students have the opportunity to develop skills with which to counsel parents on immunizations, child visits, parameters of growth and development, common psychosocial problems, nutrition, and accident and poisoning prevention.

Students may also have the chance to learn how to administer immunizations and, when possible, to do audio and visual screening. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1344 Applied Study in Psychiatry 4 Q.H.

The student is offered exposure to a wide variety of psychiatric problems. Clinical settings include wards, clinics, and multiservice centers. Students are expected to perform mental status exams and to do cognitive testing. Emphasis is on recognizing various types of psychiatric problems that require referral to a specialist and managing those problems that can be handled by the nonspecialist. Rotations may also assist students in furthering their understanding of effective patient interactions and the psychiatric components of health, disease, and disability. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1345 Applied Study in Obstetrics and Gynecology 4 Q.H.

This rotation provides students the opportunity to become involved with obstetric and gynecological services provided by teaching hospitals in the Boston area. The emphasis in obstetrics is on pre- and post-natal care, monitoring a woman in labor, assisting in deliveries, and developing the skill necessary to deliver a child in an emergency situation. Students have the opportunity to take obstetrical histories and perform obstetrical examinations. While rotating through gynecology, the student is expected to learn how to assess and manage a variety of common gynecological problems and to counsel patients on family planning. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1346 Applied Study in Primary Care 4 Q.H.

Students on primary care rotations are offered exposure to aspects of general medical and family practice with emphasis placed on personalized care of well and sick patients. Patient education, counseling, and integration of community services, as well as medical diagnosis and management, are considered a major part of this rotation. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1347 Principles of Obstetrics and Gynecology 3 Q.H.

The anatomy and physiology of human reproduction; normal conception, pregnancy, and delivery; problems in conception; the management of pre- and post-natal periods; and the care and resuscitation of the newborn. Emphasis is on the causes, signs, and treatment of common gynecological problems, including the significance of early cancer detection. Different methods of contraception, the effectiveness of each method, and the contraindication, if any, are covered. The course also covers the medical indications for abortion and the appropriateness of the various methods of pregnancy termination. *Prereq.: PA 1125, PA 1336, PA 1139.*

PA 1348 Principles of Orthopedics 3 Q.H.

Common orthopedic problems, including those of the hand, knee, shoulder, and back. Special problems of acute trauma and the management of uncomplicated orthopedic cases are examined. Instruction also focuses on the techniques of completing an adequate patient history and physical examination of the orthopedic patient. *Prereq.: PA 1125, PA 1336, PA 1337, PA 1139.*

PA 1349 Principles of Pediatrics II 3 Q.H.

Continuation of course from previous quarter. *Prereq.: PA 1353.*

PA 1350 Principles of Primary Care Management 3 Q.H.

The approach to and management of the patient in a primary care setting. Specific diseases and medical conditions common to primary care practice will be discussed, including low back pain, anxiety, fatigue and weight loss, chest pain, gastrointestinal problems, upper respiratory infections, obesity, and dermatologic complaints. Attention is given to psychosocial aspects of disease as well as aspects of prevention. Students are expected to have a sound basis in pathophysiology and medicine. *Prereq.: PA 1336, PA 1337, PA 1338.*

PA 1353 Principles of Pediatrics I 3 Q.H.

Physiological and psychological fundamentals of child development. Emphasis is on the major common pediatric illnesses, their signs, symptoms, and treatment regimens; various types of medications used in pediatrics, their indication and dosage in relation to specific disorders; and the management of pediatric emergencies such as cardiac arrest, anaphylaxis, convulsions, coma, and high fevers. *Prereq.: PA 1125, PA 1134, PA 1136, PA 1139.*

PA 1354 Principles of Psychiatry 3 Q.H.

An opportunity to understand how to work with patients and families exhibiting psychiatric problems. Topics include psychological growth and development, the effect of social milieu on behavior, the psychological bases of drug and alcohol abuse, and the dynamics of psychosomatic problems.

PA 1355 Principles and Concepts of Surgical Intervention in Disease Processes 3 Q.H.

Major and minor surgical conditions, with emphasis on indications for surgical intervention and pre- and post-operative management in both the ambulatory and inpatient settings. *Prereq.: PA 1336, PA 1337, PA 1125.*

PA 1356 Basic Diagnostic Radiology 2 Q.H.

An introduction to the underlying principles, use, and interpretation of radiographs pertinent to primary care medicine.

PA 1357 Cancer Prevention 3 Q.H.

Principles of primary and secondary prevention of cancer. Included in the course is information on biostatistics, cancer as a public health problem, and

cancer epidemiology. *Prereq.: PA 1336, PA 1337, PA 1338, PA 1139.*

PLA 1358 Medical Therapeutics 3 Q.H.

A case-study format that involves students in planning the management of common disease states. Used to help students understand the clinical use of common therapeutic agents. *Prereq.: PA 1336, PA 1337, PA 1338, PA 1139.*

PA 1359 Applied Study in Surgery 4 Q.H.

During this rotation students participate in a variety of surgical patient care responsibilities under the supervision of a surgical resident and/or staff surgeon. The emphasis of the rotation is on general surgery, but the students have an opportunity for varying exposure to other surgical specialties and sub-specialties. Students assist in the initial assessment of the surgical patient, including obtaining an accurate medical history and performing a physical examination. As members of the surgical team, the students are involved in pre-operative management, including patient education and any procedures necessary to prepare the patient for surgery. Students assist the surgeon in the operating room when appropriate and have the opportunity to become familiar with operating room procedures and equipment. Students are also involved in the post-operative evaluation and management of the patient. Students will have the opportunity to attend surgical grand rounds and other surgically oriented educational meetings when available at their rotation sites. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1360 Applied Study in Outpatient Medicine 4 Q.H.

During this rotation the students participate in providing health care to the outpatient adult patient under the supervision of a physician specialist in internal medicine. The students will have the opportunity to become involved in the initial assessment and management of adults with a medical complaint as well as the ongoing assessment and management of patients with established diagnoses. It is anticipated that the student will be exposed to many of the common problems encountered in medical practice, such as hypertension, diabetes, and heart disease. The emphasis is on the assessment and management of both acute and chronic medical problems. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 1361 Applied Study Elective 4 Q.H.

This full time clinical rotation provides the student with an opportunity to obtain additional exposure to

an area of clinical medicine in which the student has a special interest. Students may choose additional experience in an area covered by required rotations or select a subspecialty such as dermatology, orthopedics, cardiology, geriatrics, etc. All elective rotations are reviewed and must be approved by the clinical coordinator. *Prereq.: Successful completion of first year of Physician Assistant Program.*

PA 3101 Clinical Neurology 4 Q.H.

The clinical application of neuroanatomy and neurophysiology. Students will have the opportunity to develop an understanding of the normal functioning of the nervous system as well as to develop a clinical approach to the assessment and management of a variety of nervous system disorders and disease states.

PA 3102 Principles of Electrocardiography 4 Q.H.

Principles of electrophysiology and its application to electrocardiographic tracing. Students receive instruction in recognizing arrhythmias, rate and axis determination, conduction abnormalities, characteristic changes seen in myocardial infarction and ischemia, as well as drug and metabolic effect manifested on the electrocardiogram.

PA 3103 Rehabilitation Medicine 4 Q.H.

Techniques of effective planning and decision making for patients with multiple chronic problems. The purposes, techniques, and potential of rehabilitation medicine are also discussed. *Prereq.: PA 1336, PA 1337, PA 1338, PA 1134, PA 1139.*

PCL 1301 Basic Pharmacology 3 Q.H.

The classification, mechanisms of action, and uses of a broad spectrum of therapeutic agents. Dose response, side effects, and adverse reactions are emphasized. *Prereq.: PA students only.*

PHL 3265 Issues in Medical Ethics 4 Q.H.

Designed to help familiarize students with various philosophical perspectives in medical ethics, including historical, classical, ethical, and contemporary philosophies related to issues such as abortion, truth telling, genetic control, and the allocation of scarce medical resources. Euthanasia and paternalism are among topics discussed during the course.

SOC 3226 The Aging Process 3 Q.H.

Socioeconomic and social-psychological consequences of aging from the perspective of health care providers. A major part of the course focuses directly on the biological changes entailed in aging and the appropriate medical management of geriatric patients. Open to students expected to provide health care services to geriatric patients.

Academic Calendar 1986-87

September 1986

1	Monday	Labor Day. University closed.
8-12	Monday-Friday	Final examinations for Graduate Schools.
16-17	Tuesday-Wednesday	Fall 1986 registration—Burlington 1:00-3:00, 5:30-8:00
18	Thursday	Fall commencement.
15-20	Monday-Saturday	Vacation period.
22-25	Monday-Thursday	Fall 1986 registration—Boston 1:00-8:00
29	Monday	Beginning of 1986-87 academic year.
29	Monday	Graduate classes begin.

October 1986

13	Monday	Columbus Day. University closed.
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November 1986

11	Tuesday	Veterans' Day observed. University closed.
27-30	Thursday-Sunday	Thanksgiving Day recess.

December 1986

2	Tuesday	Winter 1987 registration—Burlington 1:00-3:00, 5:30-8:00
8-11	Monday-Thursday	Winter 1987 registration—Boston 1:00-3:00, 5:30-8:00
15-19	Monday-Friday	Final examinations for Graduate Schools.
22-January 4	Monday-Sunday	Christmas vacation.

January 1987

1	Thursday	New Year's Day. University closed.
5	Monday	Graduate classes begin.
19	Monday	Martin Luther King, Jr.'s birthday. University closed.

February 1987

16	Monday	President's Day. University closed.
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March 1987

10	Tuesday	Spring 1987 registration—Burlington 1:00-3:00, 5:30-8:00
16-19	Monday-Thursday	Spring 1987 registration—Boston 1:00-3:00, 5:30-8:00
23-27	Monday-Friday	Final examinations for Graduate Schools.
30-April 4	Monday-Saturday	Vacation period.

April 1987

6	Monday	Graduate classes begin.
20	Monday	Patriots' Day. University closed.

May 1987

25	Monday	Memorial Day. University closed.
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June 1987

15-16	Monday- Tuesday	Summer 1986 registration—Burlington 5:30-8:00
17-18	Wednesday- Thursday	Summer 1986 registration—Boston 5:30-8:00
15-19	Monday- Friday	Final examinations for Graduate Schools.
21	Sunday	Commencement.
22-27	Monday- Saturday	Vacation period.
29	Monday	Graduate classes begin.

July 1987

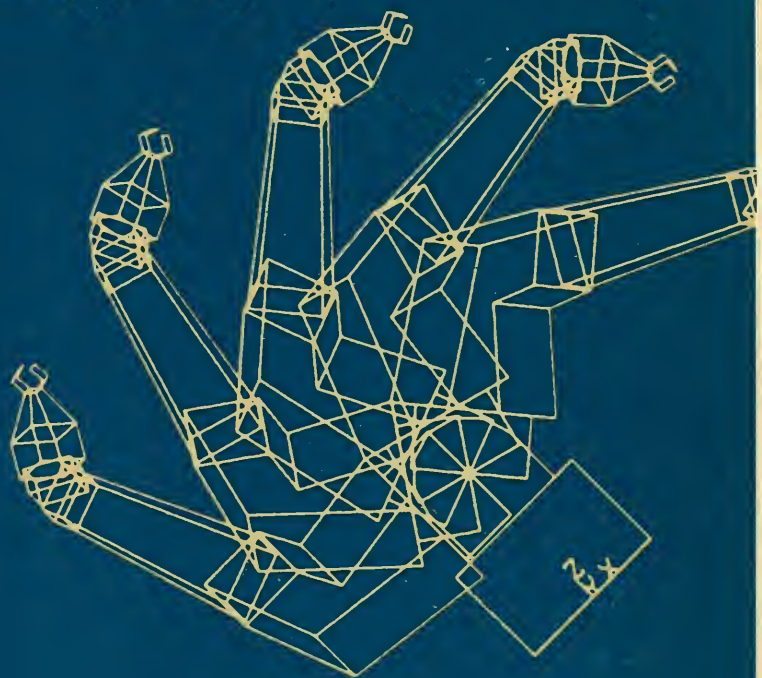
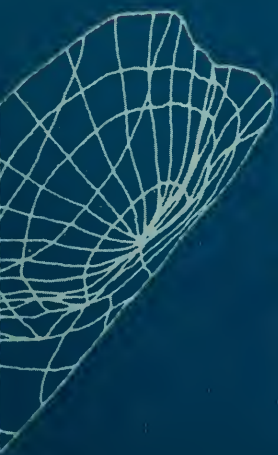
4	Saturday	Independence Day. University closed.
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September 1987

7	Monday	Labor Day. University closed.
17	Thursday	Fall commencement.
21-26	Monday- Saturday	Vacation period.
28	Monday	Beginning of 1987-88 academic year.

Calendar dates are subject to change. The University community will be notified if such changes are necessary.

School of Engineering Technology



Northeastern University
1986–1988

School of Engineering Technology

Northeastern University 1986–88

*Day and part-time programs in
engineering technology and
science technology*

*Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115*

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Northeastern University
School of Engineering Technology
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone 437-2500

_____ 19 _____

Please send me an application for admission for:

- ☐ Part-time programs (evenings and weekends)
- ☐ Day programs
- ☐ I would like to apply for advance standing credit and shall
arrange to submit transcripts of my records at all schools attended
since high school.

Signature

Street Address

City

State

ZIP Code



Office Hours

Huntington Avenue Campus, Boston

September to June

Monday–Thursday 8:30 a.m.–8:00 p.m.

Friday 8:30 a.m.–4:30 p.m.

Saturday 8:00 a.m.–3:00 p.m.

(Summer schedule subject to change)

Suburban Campus, Burlington

The bookstore is open 8:30 a.m.–8:15 p.m., Monday–Thursday (closed 1:00 p.m.–2:00 p.m. for lunch); 8:30 a.m.–1:00 p.m. on Friday. The Bursar's Office is open 8:30 a.m.–8:30 p.m., Monday–Thursday; 8:30 a.m.–4:30 p.m. on Friday (closed 1:00 p.m.–2:00 p.m. for lunch).

Dedham Campus

Monday–Thursday 8:30 a.m.–10:00 p.m.

Friday 8:30 a.m.–4:30 p.m.

Saturday 8:30 a.m.–5:00 p.m.

Sunday 12:00 noon–5:00 p.m.

Program Counseling

Program counselors are available on a regular schedule at both the Boston campus and the Burlington campus. Appointments may be arranged by telephoning the School of Engineering Technology office at 437-2500.

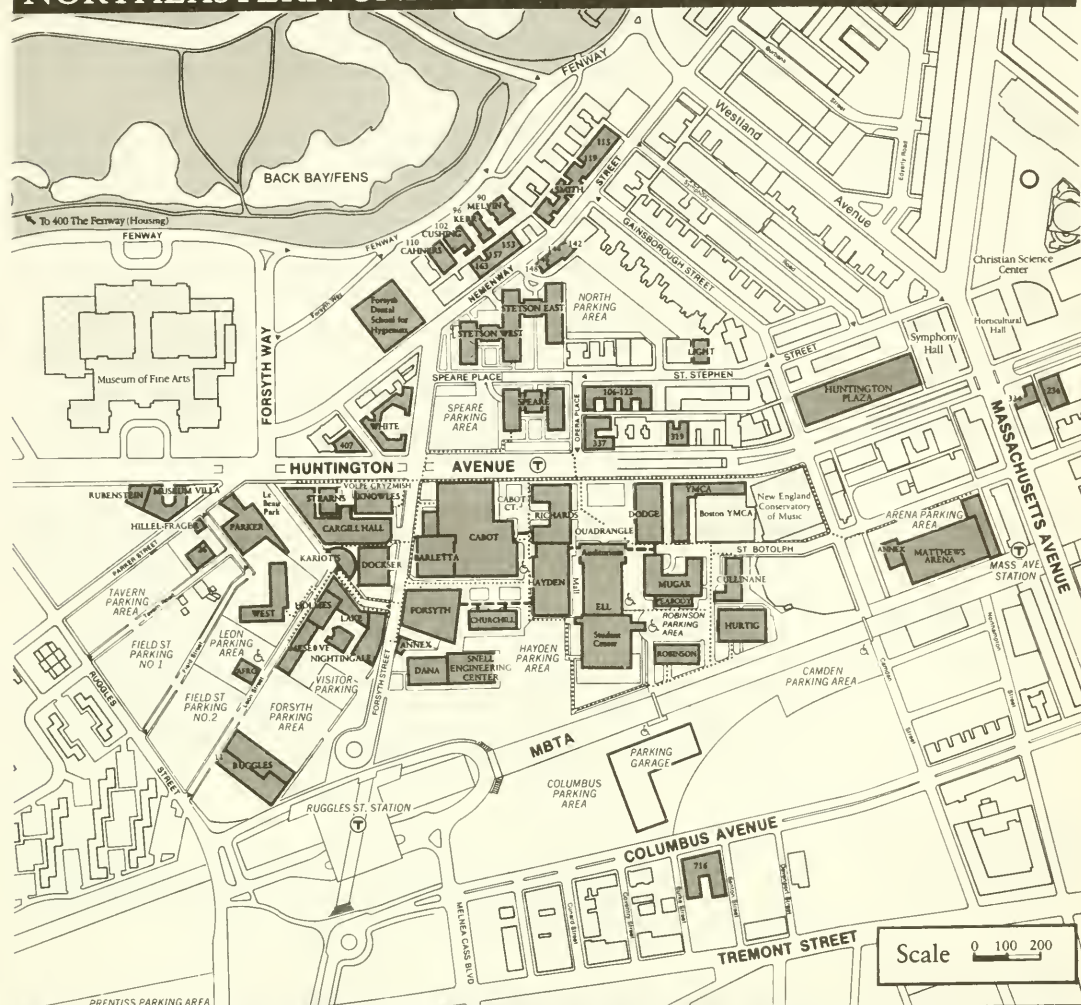
Interviews

Prospective students, or those desiring advice or guidance regarding any part of the school work or curricula, are encouraged to stop by the office for an interview. Career planning through competent guidance provides an understanding of professional requirements and develops that definiteness of purpose so vital to success. The School of Engineering Technology office is located at 120 Snell Engineering Building on the Boston campus.

Address communications to:

Director
School of Engineering Technology
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

The telephone number is: 617-437-2500.



Scale 0 100 200

A

B

C

D

E

F

Academic and Service Buildings

B	African-American Institute (AF)
C	Barletta Natatorium (BN)
DE	Boston YMCA (BY)
C	Cabot Physical Education Building (CB)
B	Cahners Hall (CA)
C	Cargill Hall (CG)
B	Churchill Hall (CH)
D	Columbus Place
D	(716 Columbus Avenue) (CP)
DE	Cullinane Hall (Botolph) (CN)
C	Cushing Hall (CU)
D	Dana Research Center (DA)
B	Dockser Hall (DK)
D	Dodge Library (DG)
D	Ell Student Building (Auditorium) (EL)
D	Ell Student Center (Student Lounge) (EC)
C	Forsyth Building (FR)
C	Forsyth Building Annex (FA)
C	Hayden Hall (HA)
A	Hillel-Frager (HF)
B	Holmes Hall (HO)
F	236 Huntington Avenue (HU)
E	Huntington Plaza
E	(271 Huntington Avenue) (HN)

DE	Hurtig Hall (HT)
B	Kariotis Hall (KA)
C	Kerr Hall (Faculty Center) (KH)
B	Knowles Center (Gryzmish Hall) (KG)
B	Knowles Center (Volpe Hall) (KV)
B	Lake Hall (LA)
F	Matthews Arena (MA)
EF	Matthews Arena Annex (MX)
B	Meserve Hall (ME)
D	Mugar Life Science Building
D	(Peabody Health Professions Center) (MU)
B	Nightingale Hall (NI)
B	Parker Building (PA)
D	Peabody Center
C	Richards Hall (RI)
D	Robinson Hall (RB)
AB	Ruggles Building (11 Leon Street) (RU)
C	Snell Engineering Center (SN)
D	122 St. Stephen Street (SS)
F	Stearns Center (ST)
B	Symphony Place
F	(334 Massachusetts Avenue) (SY)
A	26 Tavern Road (TA)

Key

Academic, Residential, and Service Buildings

Handicapped Parking

Handicapped Routes

Parking Areas

Public Buildings

Public Parks

Street Direction

Underground Tunnel

Maps are provided by the
Visitor Information Center
115 Richards Hall, extension 2736.
Some buildings on this map are used but
not owned by Northeastern University.
NUP.JY.10.6

Antidiscrimination Policy

Northeastern University is committed to a policy of equal opportunity for all students and employees without regard to race, color, religion, age, sex, sexual preference, national origin, or handicap or veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance.

Equal Opportunity Employment Policy

Northeastern University is an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, age, sex, sexual preference, national origin, or handicap or veteran status.

Northeastern University also prohibits discrimination against any employee regarding upgrading, demotion or transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training. In addition, the University adheres to Affirmative Action guidelines in all recruitment endeavors.

Further, Northeastern will not condone any form of sexual harassment, which is defined as the use of unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature as an explicit or implicit condition of employment, as the basis for employment decisions, or when such conduct interferes with an individual's work performance by creating an intimidating, hostile, or offensive work environment.

Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of the Rehabilitation Act of 1973, Affirmative Action Office, 175 Richards Hall, 617-437-2133.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), WRKO (680) and FM stations WBCN (104.1) and WROR (98.5) are authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

Office of Services for the Handicapped

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Rehabilitation Act of 1973 are coordinated by Ruth Bork, OSH director, 5 Ell Center, 617-437-2675.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere, and the most congenial conditions it can provide. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern, and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are. In brief, the University is there to offer you educational opportunities and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registrations of the School of Engineering Technology.

Disclaimer

Tuition rates, all fees, rules and regulations, and courses and course content are subject to revision by the President and the Board of Trustees at any time.

Northeastern University International Mission Statement

Northeastern University, a world leader in cooperative education, acknowledges the increasing interdependence among nations, and, therefore, identifies its mission as preparing its graduates to live and work in an interdependent world. The University deems it essential that its students, both in the professions as well as in the humanities, develop a greater awareness and understanding of those social, political, and economic issues that transcend national boundaries. So interconnected are these issues that a recognition of them coupled with an appreciation of the diverse culture which gave rise to them is necessary for the development of productive and responsible citizens of the world community.

To accomplish this goal, Northeastern University actively seeks qualified students from abroad to enroll in its undergraduate and graduate programs in such numbers and with such geographic origins so as to create and foster a truly global exchange of ideas and values among students, faculty, and staff.

The University also encourages all colleges to continually develop and expand course offerings to include international issues and cross-cultural aspects and supports faculty to teach and conduct research in the interrelationship among nations and peoples. The University promotes international understanding and the sharing of ideas with institutions throughout the world by virtue of its faculty and staff exchanges and its study and work abroad programs for students.

Finally, the University recognizes that it has a special responsibility to share its expertise and to cooperate with international organizations, the local community, its alumni, and diverse segments of the public in an effort to promote greater awareness of global issues and events.

Accreditation

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

Academic Calendar

1986–87

Fall Quarter 1986

Classes begin Monday, September 29, 1986

Fall Registration Dates

Belmont High School

Wednesday, September 3, and
Tuesday, September 9,
5:30–8 p.m.

Boston Main Campus

Tuesday–Friday,
September 2–5,
5–7:30 p.m.;
Saturday, September 6,
9 a.m.–12 noon;
Monday–Wednesday,
September 8–10, and
Monday–Wednesday,
September 15–17,
5–7:30 p.m.

Downtown Boston Campus

(5 Liberty Square)
Tuesday–Tuesday, September 2–9,
11 a.m.–6:30 p.m.

Brockton High School

Wednesday, September 3, and
Monday, September 8,
5:30–8 p.m.

Burlington Suburban Campus

Thursday, September 4,
5:30–8 p.m.;
Friday, September 5,
12–3 p.m. and 5:30–8 p.m.
Monday–Tuesday, September 8–9,
5:30–8 p.m.

Chelmsford High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 p.m.

Dedham Campus

Thursday, September 4, and
Tuesday, September 9,
5:30–8 p.m.

Framingham North High School

Tuesday, September 2, and
Monday, September 8,
5:30–8 p.m.

Lynnfield Middle School

Wednesday, September 3, and
Monday, September 8,
5:30–8 p.m.

Marlboro High School

Wednesday, September 3, and
Monday, September 8,
5:30–8 p.m.

Marshfield High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 p.m.

Milford High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 p.m.

Revere High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 p.m.

Westwood High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 p.m.

Weymouth North High School

Wednesday, September 3, and
Monday, September 8,
5:30–8 p.m.

Fall Quarter 1986 (continued)

Fall quarter classes begin Monday, September 29	Final examination period for fall quarter Monday–Sunday, December 15–21
Columbus Day observed Monday, October 13	Christmas vacation Monday–Sunday, December 22– January 4
Veterans’ Day observed Tuesday, November 11	
Thanksgiving recess Thursday–Sunday, November 27–30	

Winter Quarter 1987

Classes begin Monday, January 5, 1987

Winter
Registration Dates

Belmont High School Tuesday, December 9, 5:30–8 p.m.	Marlboro High School Monday, December 8, 5:30–8 p.m.
Boston Main Campus Monday–Thursday, December 8–11, 5–7:30 p.m.	Marshfield High School Tuesday, December 9, 5:30–8 p.m.
Downtown Boston Campus (5 Liberty Square) Monday–Thursday, December 8–11, 11 a.m.–6:30 p.m.	Milford High School Tuesday, December 9, 5:30–8 p.m.
Brockton High School Monday, December 8, 5:30–8 p.m.	Revere High School Tuesday, December 9, 5:30–8 p.m.
Burlington Suburban Campus Monday–Thursday, December 8–11, 5:30–8 p.m.	Westwood High School Tuesday, December 9, 5:30–8 p.m.
Chelmsford High School Tuesday, December 9, 5:30–8 p.m.	Weymouth North High School Tuesday–Wednesday, December 9–10, 5:30–8 p.m.
Dedham Campus Monday–Tuesday, December 8–9, 5:30–8 p.m.	Winter quarter classes begin Monday, January 5
Framingham North High School Monday–Tuesday, December 8–9, 5:30–8 p.m.	Martin Luther King, Jr.’s Birthday observed Monday, January 19
Lynnfield Middle School Tuesday, December 9, 5:30–8 p.m.	Presidents’ Day observed Monday, February 16
	Final examination period for winter quarter Monday–Sunday, March 23–29
	Spring recess (or make-up period for lost snow days) Monday–Sunday, March 30–April 5

Spring Quarter 1987

Classes begin Monday, April 6, 1987

Spring Registration Dates

Belmont High School

Tuesday, March 17
5:30-8 p.m.

Boston Main Campus

Monday-Thursday,
March 16-19,
5-7:30 p.m.

Downtown Boston Campus

(5 Liberty Square)
Monday-Thursday,
March 16-19,
11 a.m.-6:30 p.m.

Brockton High School

Wednesday, March 18,
5:30-8 p.m.

Burlington Suburban Campus

Monday-Thursday,
March 16-19,
5:30-8 p.m.

Chelmsford High School

Tuesday, March 17
5:30-8 p.m.

Dedham Campus

Monday, March 16, and
Wednesday, March 18,
5:30-8 p.m.

Framingham North High School

Monday-Tuesday,
March 16-17,
5:30-8 p.m.

Lynnfield Middle School

Monday, March 16,
5:30-8 p.m.

Marlboro High School

Monday, March 16,
5:30-8 p.m.

Marshfield High School

Tuesday, March 17,
5:30-8 p.m.

Milford High School

Tuesday, March 17,
5:30-8 p.m.

Revere High School

Tuesday, March 17,
5:30-8 p.m.

Westwood High School

Tuesday, March 17,
5:30-8 p.m.

Weymouth North High School

Monday, March 16, and
Wednesday, March 18,
5:30-8 p.m.

Spring quarter classes begin
Monday, April 6

Patriots' Day observed
Monday, April 20

Memorial Day observed
Monday, May 25

Final examination period for spring
quarter
Monday-Sunday, June 15-21

Commencement
Sunday, June 21

Summer Quarter 1987

Classes begin Monday, June 22, 1987

Registration for Entire Summer Quarter

Boston Main Campus
Monday–Thursday,
June 8–11,
5–7:30 p.m.

Burlington Suburban Campus
Monday–Wednesday,
June 8–10,
5:30–8 p.m.

Registration for Second Five-Week Summer Term

Boston Main Campus
Monday–Tuesday,
July 13–14,
5:30–8 p.m.

Burlington Suburban Campus
Monday, July 13,
5:30–8 p.m.

Independence Day observed
Saturday, July 4

Labor Day observed
Monday, September 7

Final examination period for summer
quarter held during last class session of
each term

Summer quarter classes begin
Monday, June 22

Second summer quarter session
classes begin
Monday, July 27

Note: The 1987–88 Academic Calendar
will follow a pattern similar to the
1986–87 Academic Calendar; however,
contact the School of Engineering
Technology for specific registration
dates.

SNELL ENGINEERING CENTER



The University

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, a body of nearly two hundred distinguished business and professional men and women. The Board of Overseers, chosen from the membership of the Corporation, based on their exceptional interest in and support of the University, is also a participant in the affairs of the institution.

From its beginning, Northeastern University's dominant purpose has been to identify community educational needs and to meet those needs in distinctive and serviceable ways. The University has not duplicated the programs of other institutions but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its cooperative plan of education, under which students alternate periods of work and study. This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and to contribute to the financing of their education. All of Northeastern's undergraduate day colleges operate on the cooperative plan, which requires five years for the student to earn a degree. The College of Arts and Sciences also offers a four-year, noncooperative option. Several of Northeastern's graduate schools have structured their programs to include the features of cooperative education.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers part-time courses – offered by the University since 1906 – and adult day courses leading to certificates and to associate's and bachelor's degrees. In addition to offering day undergraduate programs in computer technology, electrical engineering technology, and mechanical engineering technology, the School of Engineering Technology offers evening/part-time associate's and bachelor's degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at Northeastern's

campuses in Boston, Burlington, and Dedham. Evening courses are also scheduled in Belmont, Brockton, Chelmsford, Framingham, Lynnfield, Marlboro, Marshfield, Milford, Revere, Westwood, and Weymouth.

For more information about the undergraduate colleges, their programs, or the cooperative plan of education, contact the Admissions Office, Northeastern University, 360 Huntington Avenue, Boston, MA 02115; 617-437-2200.

Undergraduate Colleges

Boston-Bouvé College of Human Development Professions

Boston-Bouvé College of Human Development Professions offers programs leading to the Bachelor of Science in Education in early childhood education, elementary education (with a minor in special education), human services, physical education, school and community health education, secondary education, and speech and hearing; the Bachelor of Science in Recreation and Leisure Studies; and the Bachelor of Science in Physical Therapy. For more information, call 617-437-2200.

College of Arts and Sciences

The College of Arts and Sciences offers programs in the arts, humanities, social sciences, mathematics, and sciences leading to the Bachelor of Arts and Bachelor of Science degrees. Programs are normally four years in length on a full-time plan or five years in length on the cooperative plan. For more information, call 617-437-3980.

College of Business Administration

The College of Business Administration offers a five-year cooperative education program leading to the Bachelor of Science in Business Administration. Students complete a six-course concentration in accounting, human resources management, marketing, finance and insurance, management, international business administration, entrepreneurship and new venture management, transportation and physical distribution management, or a self-designed concentration. For more information, call 617-437-2200.

College of Computer Science

The College of Computer Science offers a five-year cooperative education program in computer science leading to the Bachelor of Science in Computer Science. Areas of concentration include artificial intelligence, data bases, languages, and systems. For more information, call 617-437-2462.

College of Criminal Justice

The College of Criminal Justice offers a five-year cooperative education program leading to the Bachelor of Science degree. For more information, call 617-437-3327.

College of Engineering The College of Engineering offers five-year cooperative education programs in chemical, civil, electrical (including a power systems option and a computer engineering option), industrial, and mechanical engineering leading to the Bachelor of Science with specification according to the department. A more general program leading to the Bachelor of Science without specification is also offered. For highly qualified students, the electrical and computer engineering, mechanical engineering, and industrial engineering and information systems departments offer five-year programs leading to the bachelor's and the master's degree; students carry course overloads beginning in the third year and in the senior year forego one cooperative work quarter in order to complete the course requirements for both degrees simultaneously. The College also offers a six-year, part-time evening program leading to the Bachelor of Science degree in civil, electrical, or mechanical engineering. For more information, call 617-437-2154.

College of Nursing The College of Nursing offers a five-year cooperative education program leading to the Bachelor of Science in Nursing. The program is accredited by the National League for Nursing. For more information, call 617-437-3102.

College of Pharmacy and Allied Health Professions The College of Pharmacy and Allied Health Professions offers five-year cooperative education programs leading to the Bachelor of Science in Pharmacy, Respiratory Therapy, and Toxicology and to the Bachelor of Science with specification in medical laboratory science and health record administration. Associate's degree programs are offered in medical laboratory science, respiratory therapy, and dental hygiene. The College also offers post-baccalaureate certificate programs for physicians' assistants, health record administrators, and respiratory therapists. For more information, call 617-437-3321.

School of Engineering Technology The School of Engineering Technology offers engineering technology programs leading to the Associate in Engineering, the Associate in Science, and the Bachelor of Engineering Technology degrees. These programs are made available as:

1. Full-time day curricula on the cooperative plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical Engineering Technology, Electrical Engineering Technology, Aerospace Maintenance Engineering Technology, and Computer Technology.
2. A part-time program including pre-technology preparatory courses and degree programs leading to the Associate in Engineering (A.E.), and the Bachelor of Engineering Technology (B.E.T.) in Aerospace Maintenance Engineering Technology, Civil Engineering Technology, Mechanical Engineering Technology, Electrical Engineering Technology and Computer Technology.
3. A weekend program offering the Associate in Science in Telecommunications and the upper division courses in the Electrical Engineering Technology, Mechanical Engineering Technology, and Computer Technology majors. School of Engineering Tech-

nology part-time students whose work schedule does not permit them to attend regular part-time classes may register for the weekend program or in special cases may register for a maximum of eight quarter hours of course work per quarter in the School of Engineering Technology day programs with advisor approval.

Registration materials will be available Monday through Friday in Room 120 Snell Engineering Building, Boston Campus, only during the week preceding the start of each quarter. The day class schedule will not be available at other campus locations. The Registrar will not accept registration materials for day classes without the approval of the Assistant Director of Student Services.

The day B.E.T. program is designed to meet the needs of the high school graduate, or the student transferring from a community college or technical institute, who desires a full-time day curriculum on the Northeastern Cooperative Plan.

The School of Engineering Technology offers part-time Associate in Science programs providing technological and professional development opportunities to meet the special needs of the part-time student. These programs are designed to provide trained people for ready assimilation by the engineering field and to give students the opportunity to prepare for the challenge of interfacing technology and society.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time day and evening programs in business administration, health professions and sciences, law enforcement, and liberal arts leading to the associate in science, bachelor of arts, and bachelor of science degrees. A number of certificate programs are also available. For more information, call 617-437-2400.

Graduate Schools

Boston-Bouvé College of Human Development Professions

The Boston-Bouvé College of Human Development Professions offers full- and part-time programs leading to the master of science degree with specialization in counseling psychology, physical education, physical therapy, recreation management, and speech-language pathology and audiology.

The master of education degree may be earned with specialization in counseling, consulting teacher of reading, curriculum and instruction, educational research, human development, rehabilitation, and special education. The doctor of education degree may be earned in leadership: administration and supervision, with specialization in counseling, educational administration, or rehabilitation administration. For more information, call 617-437-2708.

College of Arts and Sciences

The College of Arts and Sciences offers programs leading to the master of arts degree in economics, english, history, journalism, political science, psychology, sociology, and social anthropology. The master of science degree is available in biology; chemistry; economic policy and planning; law, policy, and society; mathematics; and physics. The Master of Technical and Professional Writing, the Master of Science in Health Science, the Master of Journalism in News Media Management, and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the certificate of advanced graduate study in advanced literary study and to the doctor of philosophy degree in biology; chemistry; economics; law, policy, and society; mathematics; physics; psychology; and sociology. There are also certificate programs in economics of manpower and development planning and in technical writing. Most programs may be completed through either full- or part-time study. For more information, call 617-437-3980.

College of Business Administration

The College of Business Administration offers five programs leading to the Master of Business Administration (M.B.A.) degree. Options include a cooperative education M.B.A. program, a full-time M.B.A. program, and a part-time M.B.A. program. An executive M.B.A. program tailored to the needs of experienced managers and a high technology M.B.A. program designed for professionals in the high technology community are offered on a part-time basis. A non-degree program leading to the certificate of advanced study is also available. For more information, call 617-437-2714.

The Graduate School of Professional Accounting offers a full-time program leading to the master of science degree. For more information, call 617-437-3244.

The Center for Management Development offers a variety of non-degree programs and workshops at the graduate level, including the Management Development Program, the Management Workshop 1 and 2, the Management Workshop in High Technology, and the Smaller Business Executive Program. Call 617-437-3272 for more information.

College of Computer Science

The College of Computer Science offers full- and part-time programs leading to the Master of Science in Computer Science. Programs concentrate on artificial intelligence, communications and networks, data bases, interactive systems design, systems software, and theory. For more information, call 617-437-2462.

College of Criminal Justice

The College of Criminal Justice offers both full- and part-time programs leading to the Master of Science in Criminal Justice. Criminal Justice students may concentrate in administration and planning, criminology and research, or security administration, or they may develop their own multidisciplinary concentration under the supervision of a faculty advisor. For more information, call 617-437-3327.

College of Engineering

The College of Engineering offers programs leading to the master of science degree with specification in chemical, civil, electrical, industrial, and mechanical engineering; computer systems engineering; information systems; and transportation. A five-year program leading to both a bachelor's and a master's degree is offered in electrical, industrial, and mechanical engineering, and a six-year program leading to both a bachelor's and a master's degree is offered in power systems. Professional engineer's degrees are offered in electrical, industrial, and mechanical engineering. The doctor of philosophy degree is offered in chemical, civil, electrical, and mechanical engineering and in industrial engineering and information systems. A doctor of engineering degree is offered in chemical engineering. For more information, call 617-437-2711.

**College of Pharmacy
and Allied Health
Professions**

The College of Pharmacy and Allied Health Professions offers programs leading to the master of science degree in biomedical science, clinical chemistry, hospital pharmacy, medical laboratory science, medicinal chemistry, and pharmacology. The master of health professions degree is offered with options in general, health policy, physician assistant, and regulatory toxicology. A doctorate degree program is offered in biomedical science with specialization in medical laboratory science, medicinal chemistry, pharmaceutical sciences, pharmacology, or toxicology. A graduate program in clinical pharmacy, leading to the doctor of pharmacy, is also available. For more information, call 617-437-3211.

School of Law

The School of Law offers a full-time, day program leading to the Juris Doctor degree. The three-year curriculum includes four quarters of experience in judges' chambers, law offices, governmental agencies, or with other law practitioners. For more information, call 617-437-2395.

Center for Continuing Education

The Center for Continuing Education was established to connect the University with the educational needs of the community. The center offers a wide range of workshops, conferences, seminars, forums, and special training programs in such areas as business, building technology, emergency medical training, graphic arts, health, management, nursing, paralegal studies, and test preparation courses for the SAT, GMAT, LST, and GRE examinations. For more information, write or call the Northeastern University Center for Continuing Education, 370 Common Street, Dedham, MA 02026; 617-329-8000.

Insurance and Financial Services Institute

The Insurance and Financial Services Institute was established to foster excellence in the insurance and financial services communities in the Boston area. It offers a number of courses in preparation for the chartered life underwriter and chartered property-casualty underwriter designations as well as programs in general insurance, risk management, insurance licensing, and NASD Series 7 and 63. The institute also offers a number of seminars designed to address timely issues in both the insurance and financial services professions. For more information, call or write the Northeastern University Insurance and Financial Services Institute, 89 Main Street, Suite 203, Medway, MA 02053; 617-533-5101.

Research

Research, whether performed in the laboratory, in the library, or in the field, is vital to the University's operation. It stimulates all participants and ensures a thriving academic atmosphere. Through research, faculty members and students stay abreast of the most recent developments in their particular fields. Faculty who disseminate this knowledge through publishing, speaking, and teaching help ensure a university education of the first order.

At Northeastern University, research and scholarly endeavors are taken very seriously and are actively encouraged. Each year the faculty receive funding for an ever-increasing number of research projects. Sponsorship comes from a variety of sources. Federal agencies, private industry and foundations, and the University itself all contribute to Northeastern's growing research emphasis.

While much of this research is carried out by faculty members, their graduate students, and post-doctoral research associates, ample

opportunities exist for undergraduate students. Research participation can take place as part of regular academic programs, as specially designed independent studies, or through cooperative work assignments. Research activities are encouraged and are limited only by the student's own motivation and curiosity.

Northeastern University has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institute of Health Research Awards. Faculty members lecture the world over – from just across the Charles River in Cambridge to clear across the Pacific Ocean in Sydney, Australia.

In addition, many faculty serve as United States government consultants and participate on a variety of national and international committees. But because Northeastern considers education its primary mission, students will always find an enthusiastic and accessible faculty to answer questions, solve problems, and stimulate inquiring minds.

Current research spans almost every academic and professional field and is not limited to laboratory investigations or the "hard" sciences. All academic units at Northeastern participate in the University's basic and applied research efforts.

Facilities and Resources

In 1910, Northeastern University began construction on the first piece of land acquired at its present Huntington Avenue site. Since those early days, the central Boston campus has grown to occupy over fifty-five acres of land located close to such cultural landmarks as Symphony Hall, the Museum of Fine Arts, the Isabella Stewart Gardner Museum, Horticultural Hall, and the Boston Public Library. The University is within walking distance of Fenway Park, Copley Place, the Back Bay shopping district, and a number of renowned hospitals, including Brigham and Women's and Harvard teaching hospitals.

In addition to five suburban campuses, a number of branch locations, and several off-campus athletic facilities, Northeastern maintains a variety of affiliations that provide its students access to facilities and specialized equipment at other institutions and organizations.

The main Boston campus is built around a quadrangle, one side of which faces Huntington Avenue, a major artery dividing the campus. The buildings surrounding the quadrangle characterize the urban design of the campus, and the innovative design of the new buildings that have been added in recent years has maintained an architectural theme that is both attractive and functional.

The campus itself has been planned to provide easy access to classrooms, laboratories, and administrative offices through a series of connected walkways and a network of underground corridors providing routes that are especially convenient during periods of inclement weather. As the University continues to expand, parking and recreational areas are integrated into the campus along with new academic facilities.

Suburban Facilities

Northeastern University's five suburban campuses provide administrative and classroom facilities for the University's graduate, adult, and continuing education programs, as well as the environment necessary for specific programs of study that could not be accommodated in an urban area.

The Warren Center provides a practical laboratory in outdoor education and conservation and in camping administration, programming, and counseling. It also offers a summer campsite for various community and University groups and activities and is available as a conference and workshop site.

The Marine Science and Maritime Studies Center is located in Nahant, on Massachusetts Bay, twenty miles northeast of Boston and serves as a site for national, international, and University research.

Henderson House is Northeastern University's conference center. Located twelve miles from Boston in suburban Weston, Henderson House hosts a variety of activities, including residential seminars, workshops, short courses, and weekend meetings.

The Suburban Campus of Northeastern University is located in Burlington, near the junction of Routes 128 and 3. Part-time undergraduate courses in a variety of subject areas and part-time graduate courses in engineering and business administration are offered here. The Burlington campus also offers special programs for adults and noncredit continuing education courses.

The Suburban Campus is situated close at hand to another Northeastern University facility, the Botanical Research Station in Woburn, which contains a small arboretum and a spacious greenhouse for propagation and research.

One of the most recent campus acquisitions is the twenty-acre Dedham Campus, just north of 128. This facility houses the Center for Continuing Education and provides space for the College of Business Administration's High Technology M.B.A. program.

University Libraries

The University Libraries include seven units. On the Boston campus, there is the main facility, Dodge, and three libraries that house graduate-level collections in chemical and biomedical sciences, mathematics and psychology, and physics and electrical engineering. There are also libraries located on the Burlington and Dedham campuses and at the Marine Science and Maritime Studies Center in Nahant.

The total holdings of the University libraries include the equivalent of more than one million volumes in print and in microform; 5,000 periodical titles; 300,000 government documents; and 24,000 items in audio-visual and computer software formats.

In the main library, the Learning Resources Center provides computer-assisted instruction, microcomputer facilities, and language and music listening laboratories. Also housed in the center is an extensive set of self-paced media materials in various interactive formats, including audiotapes, videotapes, and computer-assisted lessons and exercises.

The University's membership in the Boston Library Consortium generally allows Northeastern University students on-site use of consortium libraries at the following institutions: Boston College, Boston Public Library, Boston University, Brandeis University, Massachusetts Institute of Technology, State Library of Massachusetts, Tufts University, the University of Massachusetts (Amherst, Boston, and Worcester campuses), and Wellesley College. Borrowing privileges may also be granted to graduate students who hold a consortium card.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, a cafeteria with seating for more than 1,000, and a bookstore.

Lane Health Center

A comprehensive program of medical care is provided to all full-time graduate and undergraduate students. The University maintains a health services clinic, which is open for emergencies at all times and is equipped to deal promptly with any medical condition that may arise. All entering full-time students must submit a pre-entrance physical examination form provided by the Lane Health Center prior to registration. Failure to fulfill this requirement can delay registration and result in a penalty fee and an additional fee for a physical examination.

Counseling and Testing Center

Counseling and testing to aid a student or prospective student with career, educational, or personal concerns are available days and certain weekday evenings until 8:30 p.m. Information and appointments may be obtained by calling 617-437-2142 or by visiting the Counseling and Testing Center.

Office of Services for the Handicapped

Any student who has a disability-related need, no matter how small or individual, can receive ready support services from the Office of Services for the Handicapped (OSH). Frequently, students are uncertain about how they may be aided by this office, and in these situations a discussion of possible alternatives can be quite helpful. OSH provides a wide range of support services to eliminate the competitive disadvantages that a disability may create. Services are individually tailored to meet the needs of each student.

The types of assistance available from the office include orientation, registration and preregistration, an information clearinghouse, counseling, housing, and services for the hearing-impaired, the wheelchair user/mobility impaired, and learning disabled student.

The office is also the gathering place for the Disabled Student Organization of Northeastern University, which works cooperatively with OSH to plan programs and improve accessibility of services for the handicapped persons at Northeastern.

Office of Multicultural Student Affairs

The Office of Multicultural Student Affairs was created for the purpose of meeting the needs of Third World students. The office oversees the coordination and implementation of support services provided by the English Language Center and the International Student Office. Moreover, the office provides advocacy representation at the upper level of University administration, thereby ensuring that international and English as a second language student needs are being comprehensively addressed.

Network Northeastern University

Network Northeastern University (NNU) represents the University's entry into the age of education by telecommunications. The network uses the microwave-based Instructional Television Fixed Service (ITFS) system whereby educational services are delivered directly to company sites and other remote locations within a forty-mile radius of Northeastern's main Boston campus. With this service, live classroom instruction is telecast in color to remote sites, where it is viewed in reception rooms equipped with television monitors and a telephone-based talkback system. During presentation, off-campus students are able to participate in the instruction as fully as the students on campus. A courier service collects and delivers homework assignments and serves as the off-campus student's link to the bookstore, registrar, and other campus services.

Network Northeastern currently offers courses in graduate engineering, graduate computer science, state-of-the-art professional development courses, undergraduate engineering technology, arts and sciences, and non-credit nursing courses. This instruction is telecast daily between 8 a.m. and 10 p.m. on four channels to off-campus students at twenty-two company sites and two suburban campuses.

Academic Computer Services

Academic Computer Services supports research activities of faculty, research personnel, and graduate students, as well as teaching and learning activities at both the graduate and undergraduate levels. The computational capability of this facility includes 270 assorted personal computers linked in local-area networks at the Boston, Burlington, and Dedham campuses. A wide-area network also provides students and faculty with time-sharing access to five large computers through video and hard-copy terminals arranged in clusters at all three campuses. The wide-area network connects a Digital Equipment Corporation VAX 8650 system plus an additional VAX 11/785 and a Data General MV/8000. This network also provides access through a number of dial-in telephone lines, primarily for faculty use, to all five computers. A variety of graphics and output devices is also available. Effective use of all facilities is promoted by the availability of programming assistance at all three campuses.

Electronic spreadsheet and word-processing packages are available, as well as numerous software libraries for numerical, statistical, and financial applications. The primary languages supported are FORTRAN, COBOL, BASIC, PASCAL, and Assembler.

Department of Career Development and Placement

The Department of Career Development and Placement offers a wide range of counseling and placement assistance to all seniors, graduate students, and alumni of Northeastern University seeking employment, as well as to students interested in participating in nonpaid, part-time internships in private or public nonprofit agencies for which they may receive academic credit.

Through this department, representatives of hundreds of employers are scheduled to visit the campus each year to interview seniors and graduate students for full-time employment after graduation. A job bank of currently available positions is maintained for alumni who are seeking new opportunities. Credential service is

provided for students and alumni seeking positions in the field of education and for applicants for graduate and professional schools. Regularly scheduled seminars are conducted for seniors, graduate students, and alumni on career development, job-finding techniques, résumé preparation, and effective interviewing. Individual career counseling is available for seniors, graduate students, and alumni of all University programs.

Sport, Dance, and Exercise Facilities

Through its Cabot Center for Physical Education, Dockser Hall, and Barletta Natatorium, Northeastern University offers a wide variety of specialized facilities, including basketball courts, dance studio, indoor athletic field and running track, gymnastics room, combatives room, weight-training rooms, swimming pool, crew practice tank, racquetball courts, and motor performance and exercise physiology laboratories. The Matthews Arena, with seating for more than 5,000 fans, provides home ice to the University's varsity and sub-varsity hockey teams and, when the portable playing floor is down on the ice, home court to the University's basketball teams.

For organized athletics requiring facilities not available on the main campus, Northeastern maintains several off-campus locations, including the Northeastern Boat House, which is located on Memorial Drive in Cambridge and provides a home for the University's crew teams. The Edward S. Parsons Field, on Kent Street in Brookline, is the playing ground for the football, baseball, women's lacrosse and women's field hockey teams, and some intramurals. The Bernard M. and Jolane Solomon Track, a recently completed outdoor track and field facility in Dedham, has an eight-lane, Action Trak 200 running surface and an expansive area for concurrent jumping and field events. This new facility is ready to host dual and championship meet competition and is a permanent site for Northeastern University track athletes.

School of Engineering Technology Administration

Administrative Officers

Thomas E. Hulbert, B.Mgt.E., M.S., P.E., *Director*

Rasma Galins, *Assistant Director*

Roy A. Dalsheim, B.S., *Assistant Director*

Rosanne L. Bogan, A.S., *Staff Assistant*

John Kaczorowski, Jr., B.S., M.S., *Assistant Director*

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Francis R. Hankard

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Ernest E. Mills

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Rosanne L. Bogan, A.S.
Franklyn K. Brown, B.S., M.Ed. (Engineering Design)
Leroy M. Cahoon, B.S.C.E., M.S., P.E. (Program Consultant, Civil Engineering Technology)
Robert W. Case, Ph.D. (Coordinator, Day Mathematics)
Roger T. Connor, A.B., M.Ed. (Course Consultant, Calculus)
Gregory Czarnowski, A.B., M.Ed. (Technical Communications)
Roy A. Dalsheim, B.S.
William D. Finan, A.B., M.A., D.Ed. (Introductory Mathematics)
Peter D. Gianino, B.S., M.S. (Differential Equations)
David Goldberg, B.S., M.S.E.E., M.S.E.M. (Electrical and Electronic Graphics)
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Israel Katz, M.S. (Thermodynamics)
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Edward L. Rich, B.S., M.S., P.E. (Mechanical Tech. Laboratory)
Raimundas Sukys, B.S., M.S. (Pulse Circuits, Electronics and Principles of Communication Systems)
James Welch, B.S.E.E., M.S. (Computer Technology Hardware Courses)
Albert G. Wilson, Jr., B.S., C.E., M.S., P.E. (Statics and Dynamics)

Office Staff

Kordi N. Heidel, *Secretary*
Elsie Man, *Secretary of Exams*
Christine A. Rossi, *Secretary of Records*
Bonнита E. Keelan, *Clerk-Typist*



The Role and Scope of the School of Engineering Technology

Purpose

The School of Engineering Technology is charged with the responsibility for developing and offering college-level courses and curricula in engineering technology. Its purpose is to educate technologists to assist professional personnel in dealing with the applications and uses of the biological, engineering, and physical sciences in better meeting community needs. The programs of study conducted by the school have in common the following characteristics:

1. They offer the student the opportunity to prepare for activities allied to the fields of engineering, science, or medicine.
2. They are more specialized than those required to prepare an engineer, physicist, or medical doctor.
3. They are more concise and more applied in content than in a professional curriculum, although they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
4. They are based upon principles of science, and include post-secondary school mathematics to provide the tools to achieve the technological objectives of the curricula.
5. They emphasize the use of rational processes in converting theories and ideas into practical techniques, procedures, and products.
6. Extensive training for artisanship or craftsmanship is not included within the scope of the technological education programs.
7. Graduates from the associate degree programs have opportunities for continued educational work leading to the Bachelor of Engineering Technology and Bachelor of Science degrees.

Scientific and technological skills range over a broad spectrum, from extremely simple craftsmanlike activity to highly complex and abstract activity. At one end of the spectrum is the professional whose work is mostly theoretical in character. He or she studies, reasons, and visualizes how new knowledge may be used in the development of solutions to technical problems. This person usually is not completely knowledgeable in the detailed procedures used by the skilled craftsman who executes the ideas, procedures, and designs.

The technologist is the pivot-person on the professional-technologist-craftsman team. The technologist works with the professional engineer, scientist, doctor, or supervisor and with the craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures, and techniques. When employed in research, design, or development, the technologist usually acts in direct support of the professional. Other technologists work in capacities related to production, operation, testing, or control, following a course prescribed by a professional but not closely under the professional's direction. If installation, maintenance, or sales is the area of responsibility, the technologist is frequently performing independently and assuming the more routine professional functions demanded by our increasingly scientific and technical society.

In executing all functions, the technologist is normally required to use a high degree of rational thinking and to employ post-secondary school mathematics and the principles of the biological, natural, and physical sciences. The skilled technologist works with the mind as well as the hands and considers why, as well as how, things work. The technologist must effectively communicate technical and scientific information in mathematic, graphic, and linguistic form.

The Need for Technologists

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural, and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that, in order to meet expanding needs, the number of students graduating from the nation's professional schools must double—a goal which is improbable in the near future.

The most practical alternative is to make our professional manpower more efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one.

Opportunities for technologists are increasing. The technologist's employment opportunities are varied and include positions in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state, and federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics, and metal industries; and transportation and communication industries, among others.

Programs of Instruction

Recognizing the growing need for technicians and technologists and their expanding role in modern society, the School of Engineering Technology offers Pre-Technology Preparatory Courses and degree programs leading to the Associate in Engineering (A.E.), Associate in Science (A.S.), and Bachelor of Engineering Technology (B.E.T.) degrees as follows:

Pre-Technology Preparation

page 46 Introductory Mathematics and English

Civil Engineering Technology

page 48 Architectural Engineering Technology (A.E. degree)
page 49 Environmental Engineering Technology (A.E. degree)
page 50 Structural Engineering Technology (A.E. degree)
page 51 Surveying and Highway Engineering Technology (A.E. degree)
page 52 Civil Engineering Technology (B.E.T. degree)
page 54 Mechanical-Structural Engineering Technology (B.E.T. degree)

Computer Technology

page 56 Computer Technology (A.E. degree)
page 58 Computer Technology (B.E.T. degree)
page 60 Computer Technology (B.E.T. degree) (Day Cooperative Curriculum)

Electrical Engineering Technology

page 62 Electrical Engineering Technology (A.E. degree)
page 64 Electrical Engineering Technology (B.E.T. degree)
page 66 Electrical Engineering Technology (B.E.T. degree) (Day Cooperative Curriculum)

Mechanical Engineering Technology

page 69 Mechanical Engineering Technology (A.E. degree)
page 70 Mechanical Engineering Technology (B.E.T. degree)
page 73 Mechanical Engineering Technology (B.E.T. degree) (Day Cooperative Curriculum)
page 75 Aerospace Maintenance Engineering Technology (B.E.T. degree)
page 77 Aerospace Maintenance Engineering Technology (B.E.T. degree) (Day Cooperative Curriculum)

Science Technology Programs

page 80 Energy Systems (A.S. degree)
page 81 Telecommunications (A.S. degree)

Admissions Information

Admission

The Student Body

The student body of the School of Engineering Technology is composed of both recent high school graduates and mature men and women. Most students are employed in industry, with vocational experience ranging from very little for the recent secondary school graduate to as much as twenty or thirty years for individuals seeking increased professional responsibility and status. Many technical career categories—industrial, engineering, scientific, and allied-medical—are represented, demonstrating that, in our increasingly complex society, the key to personal advancement is education.

Academic Background

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to the School of Engineering Technology are, in many cases, mature adults who, although they have experience in industry or previous education, have been away from formal study for some time and therefore have doubts concerning their study habits and their algebra, geometry, and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in courses in introductory mathematics. These courses are designed to develop adequate background for the basic courses in the degree programs.

Program Counseling

Career planning through self-analysis and professional counseling assists students in planning educational programs appropriate to their objectives. Entering students are encouraged to arrange for personal interviews with School of Engineering Technology program counselors for assistance in planning their academic programs. Counselors are available at the Huntington Avenue campus, Boston, and at the other School of Engineering Technology campuses listed at the front of this catalog. Schedules listing times when students may see counselors are posted at these campuses. Students are encouraged to present records of prior education whenever possible. The effectiveness of the counseling review is greatly enhanced by this information. The University, through its Counseling and Testing Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

Application for Admission

An admission application may be obtained either by writing to the School of Engineering Technology or by requesting one at the time of visiting the school.

All inquiries relative to the day cooperative programs should be referred to the Basic College Admissions Office, 150 Richards Hall.

Mathematics Placement Test

Applicants requesting admission to regular first-year mathematics are required to demonstrate proficiency in introductory or basic mathematics through the School of Engineering Technology mathematics placement test. Students who request enrollment in the Introductory Mathematics course are not required to take the test. The mathematics placement test will be administered during the first night of the College Algebra class. Students requiring additional mathematics will be placed in the appropriate class.

Students who demonstrate satisfactory proficiency in the test will be permitted to register for the first-year courses in the program of their choice. Students enrolling in Introductory Mathematics may also take Engineering Graphics.

In every case the student should carefully consider the combined work and study load and register for only those courses that contribute to the development of a firm knowledge of fundamentals and which enable the student to adjust to academic study requirements.

Classification of Students

Applicants who have filed an application for admission and who are approved by the School of Engineering Technology Academic Standing Committee are admitted as regular students in the program that they have indicated on the application.

Special Students

Students having specific course needs who do not desire a degree may register for the courses if they have the required prerequisites or their equivalents. These students will be enrolled as "special students."

Matriculation

Petition forms for admission to the status of a degree candidate are available at offices on all School of Engineering Technology campuses.

To matriculate:

1. A student who has completed sixteen quarter hours of credit in the curriculum of a School of Engineering Technology degree program may file a matriculation petition to be recognized as a degree candidate.
2. The student must have a high school diploma or its equivalent (GED) and must achieve a minimum cumulative quality point average of 2.00 (an average of "C") for all courses completed before filing the petition.

Upon successful completion of the matriculation process, students will be recognized as degree candidates and have any advanced standing credit previously awarded posted to their transcript.

The Committee on Academic Standing may require a student to take one or more aptitude tests or interest tests if his or her credentials or academic record fail to give evidence of probable academic success. In this case, the student will be notified in writing that arrangements for testing should be made with the University Counseling and Testing Center. A fee is charged for these tests.

Transfer Students and Advanced Standing Credits

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits toward the degree requirements of the School of Engineering Technology prior to matriculation.

Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in the School of Engineering Technology may be obtained by (1) transfer of credits or (2) proficiency examination.

Transfer of Credits

Subject to the approval of the Academic Standing Committee, credits may be awarded for academic work completed in other approved schools, colleges, or universities if the following criteria are met: (1) the content of the course being submitted is equivalent to that of the corresponding course in the School of Engineering Technology; (2) the grade achieved in the course submitted is "C" or higher; and (3) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants who desire advanced standing credit by transfer should indicate so when they file an application for admission. The applicant should request the registrar of the institutions of previous attendance to mail an official transcript to the School of Engineering Technology office.

Proficiency Examinations

Applicants who do not meet all the criteria for the normal transfer of credits but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience may petition the Academic Standing Committee for the privilege of taking a proficiency examination. If satisfactory proficiency is indicated by the examination, advanced standing credits may be awarded.

Re-admission

Former students who seek re-admission to the School should petition the Academic Standing Committee.

Registration

Registration for Courses

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's office during the official registration periods. Former students should be certain that they have completed prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to obtain the desired class schedule.

Changes in Registration

Changes in courses should be initiated before the opening day of classes during the official registration periods.

Official Registration Periods

Official registration periods are scheduled before the fall, winter, spring, and summer quarters during the academic year. Students are urged to register as early as possible during these periods. Dates of registration periods for each quarter are listed in the 1986-87 Academic Calendar. (See pages xii-xv.)



Academic Information

Academic Operations

Campuses and Extensions

All courses are offered at the Huntington Avenue Campus, Boston; with some courses available at the Suburban Campus, Burlington; Burlington High School; the Dedham Campus; Framingham North High School; Westwood Senior High School; and Weymouth High School.

The Quarter Calendar

Northeastern University operates on a quarter-system calendar. All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit.

Class Sessions

Classes at Northeastern are scheduled in different modules. In assessing quarter-hour weight for courses, the following statement applies: One quarter hour of credit is equal to approximately fifty minutes of instruction per week, plus two hours of individual study outside of class.

Course Work

All the usual methods of instruction are employed—lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor. (See “Makeup Examinations.”)

Library

The University Library is well equipped with technical literature. Details about its facilities and hours can be obtained by calling 617-437-2362.

Attendance

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their courses. Excessive absence during a quarter may be sufficient cause for the Registrar to remove the subject(s) from the student’s schedule.

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially, the student must notify the Registrar's office or complete the appropriate withdrawal form.

The Registrar will withdraw a student from a course who:

1. Does not attend the first three classes at the beginning of the quarter;
2. Does not attend the first two classes at the beginning of a summer term.

Academic Standards

The student is required to maintain appropriate levels of academic achievement in terms of grades, quality-point average, and the quantitative credit requirements of his or her program of study to satisfy academic progress criteria and achieve graduation from the School of Engineering Technology.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A	(4.000)	Outstanding Attainment
A-	(3.667)	
B+	(3.333)	
B	(3.000)	Good Attainment
B-	(2.667)	
C+	(2.333)	
C	(2.000)	Satisfactory Attainment
C-	(1.667)	
D+	(1.333)	
D	(1.000)	Poor Attainment
D-	(0.667)	
F	(0.000)	Failure
I	—	Incomplete
L	—	Audit (No Credit)
S	—	Satisfactory achievement in a pass-fail course; counts toward total degree requirements
U	—	Unsatisfactory achievement in a pass-fail course
X	—	Incomplete in a pass-fail course
*	—	Grade not received

A general average of "D" is unacceptable and will not allow a student to continue in the School of Engineering Technology or to receive a degree from Northeastern University. The "F" grade is a definite failure. The standard procedure for clearing failures in courses offered in the School of Engineering Technology is to repeat the course. In some instances circumstances may warrant amending the standard procedure. These circumstances are described in the

Student Handbook for day students. An “I” or “X” (incomplete) grade is used for a temporary grade to show that the student has not completed the course requirements.

Pass-Fail Courses

Degree Candidates

Any student who is not on academic probation and who has completed forty quarter hours of the required academic work for one of the School of Engineering Technology degree programs may register for one pass-fail course. Thereafter, the student may register for one course on a pass-fail basis for each ten quarter hours of successfully completed work up to a maximum of nine quarter hours of pass-fail credit. Written permission from the appropriate academic dean or designee and approval of the instructor must be obtained for each pass-fail course. At no time may a student register for more than one pass-fail course per quarter. Pass-fail courses will be restricted to social science/humanities electives only.

Nondegree Candidates

Students enrolling in School of Engineering Technology courses who are not intending to become degree candidates and who are not on academic probation may register for a course on a pass-fail basis with written permission from the appropriate academic dean or designee and approval of the instructor. At no time may a student register for more than one pass-fail course per quarter.

If the student becomes a degree candidate, only nine quarter hours of social science/humanities elective credit may be used, where applicable.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects, and take tests and examinations for informal evaluation if desired. However, regardless of the amount or quality of work completed, *no academic credit will be granted at any time for courses audited.*

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the School.

Grade Reports

Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or the School of Engineering Technology. Under no circumstances will grades be given over the telephone.

**Quality-Point
Average**

The quality points earned by the student in a given course are determined on the basis of the letter grade achieved and the number of credit hours carried by the course. The total quality points earned, divided by the total number of credit hours, constitutes the quality-point average.

- 1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
- 2. A grade of "I" will not be considered in the calculation of the final quality-point average.
- 3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.
- 4. In programs made up of combined University College and School of Engineering Technology courses, the cumulative quality-point average will include all work in both colleges.

For example, a student who has registered for thirteen courses, cleared a failure in one of them, cleared an incomplete in another by repeating the course, and received advanced standing credit in another, may calculate the quality-point average as follows:

Grade Achieved	Numerical Equivalent	X	Credit Hours	=	Quality Points
A	4.000	X	4	=	16.000
A-	3.667	X	3	=	11.001
B+	3.333	X	3	=	9.999
B	3.000	X	4	=	12.000
B-	2.667	X	2	=	5.334
C+	2.333	X	2	=	4.666
C	2.000	X	4	=	8.000
C-	1.667	X	3	=	5.001
D+	1.333	X	2	=	2.666
D	1.000	X	3	=	3.000
D-	0.667	X	2	=	1.334
F	0.000	X	2	=	0.000
FB	3.000	X	3	=	9.000
I	-	X	-	=	-
IC	2.000	X	2	=	4.000
ASC	-	X	-	=	-
		Totals	39		92.001

Quality-Point Average = $\frac{\text{Total Quality Points (92.001)}}{\text{Total Credit Hours (39)}} = 2.359$

The Registrar's office will not be able to recalculate or confirm the calculations of quality-point averages for individual students. Each student's record will be brought up to date before graduation. In the meantime, borderline cases will be checked by the School of Engineering Technology Academic Standing Committee

Cross-registration

Day Students Registering for School of Engineering Technology

Part-time Courses

Day students may register for School of Engineering Technology part-time courses only to clear deficiencies or to follow a program approved by the appropriate program coordinator. Basic College students may register for part-time courses only by completing the registration form available in the School of Engineering Technology office by the end of the first week of the quarter. These students must *not* fill out any other part-time registration materials. Approval of the program coordinator must be obtained if the course does not appear on the student's approved program sheet. Approval from the Department of Cooperative Education is required if more than one course is to be taken during a co-op term. Upon completion, approval, and submission of the registration form, the student is automatically registered for the course. If the course is a substitute for a day course, the latest grade received is considered for quality-point calculations. Students who do not appear on the part-time roster will not be admitted into the class unless they are in possession of an approved registration form. In all instances, Basic College day students must adhere to the academic and administrative requirements of the School of Engineering Technology part-time course.

Part-time Students Registering for Basic College Course

School of Engineering Technology part-time students who have been enrolled at Northeastern University for one or more quarters are eligible to register for a limited number of Basic College day courses. This policy is designed to accommodate previous School of Engineering Technology students who have experienced employment changes that make it impossible for them to continue in their part-time studies or on Saturdays. Eligible students may register for eight quarter hours of day course credit per quarter for a maximum of three academic quarters. Since these are part-time evening students in Basic College courses, tuition, fees, student services, and space availability will be based on part-time rates and departmental policy. Interested students must first determine if a specific course is to be offered in the University scheduling office, complete the registration form in the School of Engineering Technology, and have the form approved in both the Bursar's and Registrar's office. At this point the academic department will determine the space-available registration priority.

Academic Progress Criteria

It is expected that the student will at all times endeavor to achieve a high record of achievement. The Academic Standing Committee reserves the right to review all students' records and deny re-admission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the college, a student must have achieved a quality-point average of 1.4 at the completion of

twenty-four quarter hours; 1.5 at the end of forty-eight quarter hours; and 1.6 at the end of seventy-two quarter hours.

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue the program of study.

Makeup Examinations— Mid-term

A student absent from a regularly scheduled mid-term examination may petition to take a makeup examination. The fee for this examination is \$15 and must be paid by the student at the Cashier's office. This is a privilege that may be denied if abused by an excessive number of petitions or for other reasons.

Makeup mid-term examinations will be given on a Saturday at 9 a.m. in a designated room at the Huntington Avenue campus, according to the published schedule. Contact the School of Engineering Technology office, 120 Snell Engineering Building (telephone 617-437-2500).

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

Makeup Examinations—Finals

A student absent from a final examination will receive a grade of "I" (Incomplete) in the course. He or she may petition for a makeup final examination at the School of Engineering Technology office, 120 Snell Engineering Building (telephone 617-437-2500).

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a \$40 fee for taking the special final examination. Petitions may be obtained from the School of Engineering Technology office or in each off-campus Administration office. Petitions for missed finals must be filed in accordance with the published schedule.

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston campus. Those who do not take makeup final examinations as scheduled forfeit the makeup privilege.

Scholastic Probation

The Academic Standing Committee has the authority to dismiss from the school or to place on scholastic probation any student whose scholarship is deficient because of a low quality-point average or excessive outstanding failures, regardless of quality-point average.

A student on scholastic probation should be particularly diligent in current course work and make every effort to clear the academic deficiencies as soon as possible. Students whose academic records do not improve or whose failures are not properly cleared may not be allowed to register for further courses.

A student on scholastic probation who has cleared all or a substantial part of any outstanding failures may petition the Academic Standing Committee for removal from the probation list.

The Academic Standing Committee has the authority to dismiss from the School or place on disciplinary probation any student whom it may deem unworthy because of conduct or character. The committee may ask any student to withdraw from the School who is obviously out of sympathy with its aims and ideals.

Graduation Requirements

To receive the degree of Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology, the student must:

1. Have been formally accepted into "degree candidate" status by the Committee on Admissions;
2. Have completed all the courses of the particular curriculum, either by attendance at the School of Engineering Technology or by receiving advanced standing credit;
3. Have completed associate degree programs within eight years and bachelor's programs in twelve years from the date of entrance into the School of Engineering Technology (extensions of time may be granted by the Academic Standing Committee);
4. Have been in attendance for at least a year preceding the expected graduation date, and have completed at least one-fourth of the work in the School of Engineering Technology;
5. Have achieved a quality-point average of at least 1.800 in courses taken in the School to be awarded the Associate in Engineering or Associate in Science degree; or have achieved a quality-point average of at least 2.000 in all courses in his or her respective major and at least a 1.800 quality-point average overall for the Bachelor of Engineering Technology degree;
6. Have paid the graduation fee of \$40.

In addition, students:

7. May not earn two associate degrees or two bachelor's degrees in the same field of academic specialization;
8. Must complete a minimum of thirty quarter hours of additional credit to be awarded more than one associate or bachelor's degree.

Academic and Professional Awards

The academic programs offered by the School of Engineering Technology and the teaching, counseling, and professional efforts of the faculty and staff are aimed at motivating the student toward the highest possible levels of academic achievement. To encourage scholarly and professional excellence and to recognize quality achievements, the following awards are made at appropriate times during the academic year.

Dean's List Scholars

All matriculated students maintaining honor grade averages—a minimum quality-point average of 3.000 and no grades below “C”—during a quarter, while carrying a minimum of eight quarter hours of credit—are recognized as Dean's List Scholars. Students who desire certificates attesting to this honor should request them from the School of Engineering Technology office.

Scholastic Achievement Certificates

Upon graduation with an associate degree, scholastic achievement certificates will be awarded to those students who have achieved distinctly superior attainment in the academic work as follows:

- 3.000–3.499 Q.P.A. Scholastic Achievement
- 3.500–3.749 Q.P.A. High Scholastic Achievement
- 3.750–4.000 Q.P.A. Highest Scholastic Achievement

In order to be eligible for a scholastic achievement certificate, the student must earn a minimum of forty-eight quarter hours of credit in the School of Engineering Technology. Students who desire certificates attesting to this honor should request them from the School of Engineering Technology office.

Graduation with Honor

Bachelor's degree candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor, high honor, or with highest honor, depending on the final quality-point average obtained. To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at the School of Engineering Technology. Courses transferred from other educational institutions will not be considered in determining honor graduates.

University Awards

The University Awards are presented annually to seniors who have achieved high ranking cumulative academic records. Certificates are awarded at the Annual Class Day ceremony.

Technology Awards

The Technology Awards are presented annually to seniors who have demonstrated superior academic and professional capabilities in their special career fields. Appropriate certificates are distributed to outstanding students enrolled in the following program categories:

- Civil Engineering Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
- Computer Technology

Class Marshal Award

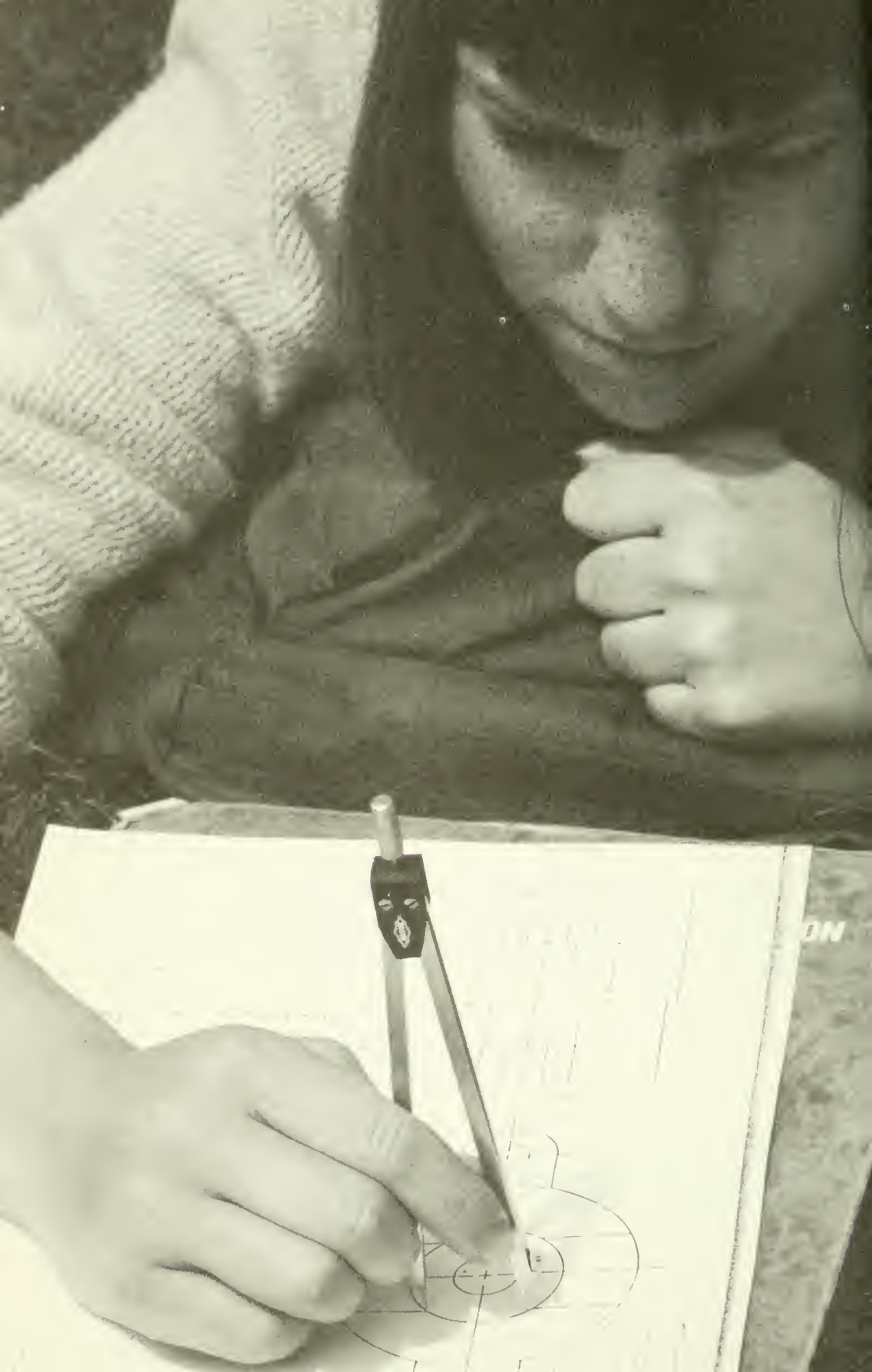
The Class Marshal Award is presented annually at the Class Day Ceremony for graduates to the top-ranking senior in a baccalaureate program. The award consists of an appropriate certificate and the President's Letter of Commendation.

Sigma Epsilon Rho Awards

Sigma Epsilon Rho, the evening colleges' scholastic honor fraternity, annually awards plaques and scholarships for outstanding scholastic achievement to the highest ranking students in University College and the School of Engineering Technology at the end of their junior year.

Alumni Award for Professional Promise

Established in 1947 by the Northeastern University Alumni Association, the Alumni Award for Professional Promise is presented annually at a final senior class meeting in the spring of the year. The award is made to the senior who has demonstrated unusual professional promise through character traits, scholastic achievement, and work performance.



Financial Information

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

Tuition

Initial Fee

A nonrefundable \$10 registration fee, required of all new students, is due and payable upon registration.

Tuition

Tuition for all part-time evening courses offered for 1986–1987 is \$98 per quarter hour of credit. Tuition for day B.E.T. students is \$3,550 per quarter. Students are permitted to audit courses; however, there is no reduction in fees for auditing.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, nor permitted to re-enroll in the University, nor have degrees conferred until all financial obligations to the University have been met.

Courses in Other University Departments

Students assigned to courses in other departments or colleges of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

Day Program Tuition Deposit

Applicants accepted for admission to the day program must upon request pay a nonreturnable tuition deposit of \$100 as evidence of their intention to enroll; this deposit will be applied to their first tuition payment.

Tuition for all courses is charged on a quarter basis and is payable in full at the beginning of each quarter.

Deferred-payment Privilege

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances, the student is advised to discuss the problem personally with the Bursar's office, where a convenient deferred-payment agreement can be worked out. A service fee of \$10 is charged for this privilege.

Late Payment Fee

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment, or a deferred-payment agreement, is not arranged by that date, a late fee of \$50 is charged by the Bursar.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specified conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Nonattendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

<i>Official withdrawal filed within:</i>	<i>Percentage of tuition</i>
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In areas in which payment is made directly by the employer to the University, the student should give the Bursar's office a purchase order covering the registration or a statement from an officer of his or her company certifying that the company is underwriting the tuition.

Student Bursar

All inquiries about student accounts should be directed to the Student Account Bursar, 617-437-2270.

Veterans' Benefits

Veterans' benefits depend on course load and increase sharply when a student's program exceeds eight quarter hours per quarter. Questions and applications should be directed to Room 126 Hayden Hall, telephone 617-437-2283.

Special Fees

International Student Fee

New undergraduate international students are charged a one time only \$200 fee, payable upon admission to the University.

Student Center Fee

Students attending the Huntington Avenue campus (Boston) in the evening in a part-time program of study will be assessed a Student Center Fee of .75 per quarter.

Health Service Fee

Students attending the Boston, full-time day cooperative B.E.T. programs are required to pay a health service fee of \$320.

Missed Examination Fees

Students absent from regularly scheduled mid-term or final examinations may petition for a “special makeup examination.” The fees are \$15 for a makeup mid-term and \$40 for a makeup final. The fee must be paid when the petition is filed in the School of Engineering Technology office.

Proficiency Examination Fee

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a “proficiency examination.” The fee for each examination requested by the applicant is \$40. The fee must be paid when the petition is filed in the School of Engineering Technology office.

Graduation Fee

The University graduation fee, charged to candidates for the associate or bachelor’s degree, is \$40 payable on or before May 1 of the year in which the student expects to graduate.

Transcript of Record Fee

Students may request transcripts of their records at the University Registrar’s office, Room 117 Hayden Hall. For an official transcript, there is a charge of \$2 per copy, payable in advance at the Cashier’s office in Room 248 Richards Hall. There is no charge for an unofficial transcript.

Textbooks and Supplies

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. Students enrolled in Engineering Graphics should be prepared to spend \$25 to \$35 for drawing supplies and \$15 to \$25 for a set of drawing instruments, in addition to the textbooks.

Financial Aid

The Office of Financial Aid, located at 254 Richards Hall, offers several types of assistance to part-time students. All awards are based on financial need. Aid granted from programs sponsored by the federal government is dependent upon the amount of funding allocated to Northeastern University.

Pell Grants

The Pell Grant Program is a federal aid program designed to provide financial assistance to those who need it to attend post-high school educational institutions. Pell Grants are intended to be the “floor” of a financial aid package and may be combined with other forms of aid in order to meet the full costs of education. The Pell Grant is an award and, unlike a loan, does not have to be repaid. Half-time students taking at least six credit hours each quarter may apply. Awards

range up to one-half the maximum allowable by law, contingent upon the total cost of education. Applications are available in the Office of Financial Aid, 254 Richards Hall, or by writing to the Pell Grant Processing Center, P.O. Box 4152, Iowa City, IA 52244.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, who are accepted as degree candidates, (that is, have sixteen credit hours and a matriculation certificate), and who show evidence of financial need.

Direct Loans are available to students who present evidence of needing financial assistance. Undergraduate students may borrow up to a maximum of \$3,000 for the first two years or a total of \$6,000 for their entire undergraduate education. Students are allowed a total maximum of \$12,000 through their undergraduate and graduate education. Repayment and interest on Direct Loans are not required until six months after a student graduates or withdraws from the institution. Repayment of principal may be extended over a ten-year period, with the interest rate of 5 percent per annum. Repayment may be deferred up to a total of three years if the student is pursuing at least a half-time course of study or serving in the Peace Corps, VISTA, or the armed forces.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parental employers or the appropriate union organization may be a source. In addition, local, civic, political, religious, or educational leaders are often aware of aid sources in the immediate community. Some typical sources may include P.T.A., Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, American Legion, and similar groups or organizations.

University Grants

Each year Northeastern University grants a substantial number of full and partial tuition grants to students who have demonstrated both above-average scholastic achievement and financial need. All applications for aid are automatically considered for all grants administered by the University. It is not necessary for an applicant to specify the grant in which he or she is interested.

Veterans' Benefits

Any veteran covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to Room 126 Hayden Hall to fill out the proper enrollment forms.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution.

Terms and conditions vary from state to state, but a student generally may borrow up to \$2,000 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

Applications for this loan are available from local banks or the education office of your state government. Additional information is available from the University Financial Aid office.

Scholarships and Application Procedures

The following School of Engineering Technology and University College scholarships and awards are available to students who have been accepted as degree candidates and are in good academic standing.

Scholarships are awarded once a year by the Scholarship Committee. Final selection of scholarship recipients is usually made in late May, followed by the awarding of the scholarships in late June or early July. Funds are usually applied to tuition expenses for the following academic year. Awards range in amount from \$250 to \$700.

In January, a mailing list of students who have requested applications is prepared, and applications are mailed out with the stipulation that they be completed and returned to the Office of the Director by March 31. A student may be placed on the January mailing list by calling 617-437-2400 and leaving his or her name, address, and student I.D. number.

Leslie B. Cutler Aviation Scholarship Awards The Leslie B. Cutler Aviation Scholarship Awards were established by the members of the Aero Club of New England to honor and give recognition to the late Senator Cutler's service and devotion to the interests of aviation in the Massachusetts General Court, national legislative bodies, and her private life. These scholarship awards are made to students who most typify the same interest, devotion, and leadership demonstrated by Senator Cutler during her long and distinguished public career.

Kappa Tau Phi Scholarships The Kappa Tau Phi Sorority Fund annually makes available scholarship awards. They are granted to those women students in the arts and sciences, business, and engineering programs who rank highest at the end of the upper-middle year. In the event that the chosen student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the bachelor's degree. In determining the recipient, grades of all courses completed in prior years shall be considered.

Martin Luther King, Jr., Scholarships These scholarships were established in 1969 in memory of the late Rev. Martin Luther King, Jr. Awards are made, as openings occur, to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter (excluding the summer quarter).

William J. McGovern Memorial Scholarship The William J. McGovern Memorial Scholarship was established in 1978 by an anonymous donor to honor the memory of William J. McGovern. The donor wishes to assist others in realizing their potential through higher education. The income from this scholarship will benefit worthy undergraduate students actively pursuing studies in the School of Engineering Technology or University College. Recipients must be in a matriculated status, demonstrate financial need and academic achievement, and exhibit a high level of professional promise.

Sigma Epsilon Rho Honor Society Scholarship Award The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the society, is awarded annually to undergraduate student(s) of the School of Engineering Technology and/or University College at Northeastern University. Eligible students must have a cumulative quality-point average of 3.0 or better after completing 75 percent or more of their required studies.

H. Patricia Taylor Scholarship Fund The H. Patricia Taylor Scholarship Fund was established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of Business. The scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree, and is an attempt to provide similar funds to assist others in realizing their potential through higher education. The income from the scholarship fund will be awarded annually to a student enrolled in University College or the School of Engineering Technology who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

Mark Caldwell Whitney Memorial Aviation Scholarship Fund This fund was established in 1981 by the family and friends of the late Mark Caldwell Whitney, an outstanding 1973 graduate of the Aeronautical Technology Program. Income from the fund will be awarded annually to a student with financial need who exemplifies Mr. Whitney's love of flying and commitment to excellence in the aviation field.

Robert G. Keene Memorial Scholarship Fund This fund was established in 1979 in memory of Robert G. Keene, a graduate of Lincoln College, now the School of Engineering Technology, Class of 1972. The endowment funds were provided by the friends and associates of Robert G. Keene and the Polaroid Corporation, where he served as an engineering manager. The income from the fund will be awarded annually to an undergraduate student in any college of the University who demonstrates financial need as well as strong character and initiative. Primary consideration will be given to children of Polaroid employees.

Student Activities and Alumni Information

Social and Professional Clubs

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the director of University College–School of Engineering Technology Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and the School of Engineering Technology are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The office of University College–School of Engineering Technology Student Activities is particularly interested in developing new clubs that will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize on the local and national levels. The program is dedicated to assisting the adult student in the development of his or her fullest potential.

Use of Gymnasium Facilities

Part-time students may utilize the gymnasium facilities from 4:00 to 9:30 p.m., Monday through Friday and during all open hours on Saturday, Sunday, and holidays. Schedules for full-time students are available at 110 Cabot. A valid Northeastern student identification card and a photo identification card must be presented to gain access to the facilities.

Specific schedules for use of the pool, Nautilus and Universal weight rooms, indoor track and cage, gymnasium, gymnastics room, and wrestling room are available at the beginning of each quarter in the Intramural Sports Office, 110 Cabot.

Alumni Association

More than 93,000 alumni are united within the Alumni Association, created to establish a mutually beneficial relationship between Northeastern and its graduates. The association is governed by an Executive Committee elected from the alumni community. Membership in the association is automatic upon graduation.

The association is headquartered in the Office of Alumni Relations in 125 Richards Hall (telephone 617-437-3186). The official records and addresses of alumni are maintained in the Office of Alumni Records (telephone 617-437-2791).

Activities of the association include the Homecoming celebration, presentation of the Outstanding Alumni Awards, and the annual presentation of Professional Promise Awards to outstanding seniors in each of the colleges. Alumni officers, in conjunction with the Office of Alumni Relations, have established a series of enrich-

ment/education programs to meet the contemporary vocational and avocational needs of Northeastern's graduates. The Alumni Association has also initiated a successful group travel program to provide the alumni of Northeastern with interesting and economical opportunities for foreign travel. Notice of all activities is provided in the *Northeastern Alumni Magazine* and in special publications.

Regional alumni clubs have been established from coast to coast. All alumni are eligible to become members of these organizations. The clubs meet periodically with varied programs, often in conjunction with professional and athletic events, faculty visits, and service projects. Additionally, alumni class organizations conduct reunions for their respective classes every five years.

The association sponsors and assists constituent organizations that focus on common professional and avocational interests and college affiliations. These groups have their own officers and conduct various programs throughout the year.

In addition, alumni volunteers in many metropolitan areas across the nation represent the Admissions Office on a continuing basis at high schools and community colleges.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

Placement Service

Many requests from employers are received by the school for men and women of potential ability to fill important positions of responsibility. It is the policy of the School to serve the students whenever possible by placing them in those positions that promise attractive opportunities for development and advancement. The School cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancement in position and income.

No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Career Development and Placement.

While the School cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the School is to find the best qualified men and women among its graduates for the position that the School is called upon to fill.

The School, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by School records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his or her services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally ask the School to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the School to assist them in filling important executive and managerial positions.

Academic Programs of Instruction

Scope of Programming

The School of Engineering Technology, independently or in collaboration with University College, conducts educational programs at the undergraduate level in the following areas of technology:

- Pre-Technology Preparation
- Civil Engineering Technology
 - Architectural Engineering Technology
 - Environmental Engineering Technology
 - Structural Engineering Technology
 - Surveying and Highway Engineering Technology
- Civil Engineering Technology
- Mechanical-Structural Engineering Technology
- Computer Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
 - Aerospace Maintenance Engineering Technology
- Science Technology
 - Energy Systems
 - Telecommunications

Degrees

The School of Engineering Technology offers education programs on the undergraduate level in various technological areas leading to the following degrees:

1. Associate in Science degree (A.S.) requiring 101 quarter hours of credit;
2. Associate in Engineering degree (A.E.) requiring 100 to 105 quarter hours of credit;
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 to 189 quarter hours of credit.

Most courses are available for special students.

Opportunities for Associate Degree Graduates

Graduates of the engineering technology or science technology programs in the School of Engineering Technology, or other similar colleges and institutions, who have earned the associate in engineering or the associate in science degree, may transfer applicable credits toward the degree requirements in the baccalaureate programs in engineering technology, medical technology, or industrial technology.

Those who have maintained a quality-point average of 2.75 or higher in the associate degree programs may apply for transfer to the College of Engineering for a Bachelor of Science in Engineering. Additional information regarding transfer may be obtained from the college's Student Services Office, telephone 617-437-2154.

PRE-TECHNOLOGY PREPARATION (Noncredit)

Beginning students who have been away from formal study for some time frequently are concerned about their study habits and their verbal, mathematical, and scientific backgrounds. Applicants who anticipate some problems should give serious consideration to enrolling in introductory courses.

Introductory Courses

These courses offer the student the opportunity to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.

Introductory Mathematics 1 and 2

A two-quarter review of high school algebra and some plane geometry designed to prepare students for the course MTH 4107 College Algebra. These courses are required of students who do not demonstrate sufficient algebra proficiency on the mathematics placement test. (See course descriptions for MTH 4081 and MTH 4082.)

English for International Students 1, 2, 3

A three-quarter, noncredit sequence for foreign-speaking students covering introduction to English grammar, with emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation; preparation of written and oral reports, business and social correspondence; and advanced work in written and spoken English preparatory to entering ENG 4110 Critical Writing 1.

CIVIL ENGINEERING TECHNOLOGY PROGRAMS

The civil engineering profession deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, air pollution control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.)

In performing these functions, the civil engineering technologist usually works in close association with professionals in the field and may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology program graduates are with town, city, state, or federal public works departments and agencies; private consulting, engineering, architectural, and construction organizations; and railroads and the military. Job opportunities will also depend upon the economy and the abilities of the individual.

The Civil Engineering Technology program and related programs offered by the School of Engineering Technology are:

Associate in Engineering Degree (part-time program)

- Architectural Engineering Technology
- Environmental Engineering Technology
- Structural Engineering Technology
- Surveying and Highway Engineering Technology

Bachelor of Engineering Technology Degree (part-time program)

- Civil Engineering Technology
- Mechanical-Structural Engineering Technology

Architectural Engineering Technology (part-time)

Major Code 025

Leading to the Degree of Associate in Engineering

The program in Architectural Engineering Technology offers students the opportunity to prepare to assume responsibilities in the planning, design, and construction of buildings. Employment opportunities are with architectural groups, consulting engineering firms, and government agencies. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170	GET 4171		Engineering Graphics 1, 2	8
		GET 4100	Comp. Prog. for Eng. Tech.	4
Second Year				
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
MTH 4121			Calculus 2	4
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
Third Year				
CHM 4111			General Chemistry 1*	3
	ENG 4111		Critical Writing 2	3
		CET 4321	Introd. to Structural Design	4
MET 4301			Mechanics A	4
	MET 4314	MET 4315	Stress Analysis A, B	8
ECN 4115	ECN 4116		Economic Principles and Problems 1, 2	6
Fourth Year				
CET 4324			Structural Analysis 1	4
	CET 4391	CET 4392	Architectural Design 1, 2	8
CET 4390			Tech. of Modern Arch.	4
	CET 4371		Concrete Design 1	4
		CET 4331	Steel Design 1	4
Total A.E. Degree				102

Note:

Associate degree graduates may transfer applicable credits toward the requirements in other School of Engineering Technology programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*Laboratory CHM 4117 required, See *University College Bulletin*.

Environmental Engineering Technology (part-time)

Major Code 011

Leading to the Degree of Associate in Engineering

The program in Environmental Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, construction operation, and supervision of municipal plants and systems concerned with the storage and distribution of water, and also the disposal of sewage and waste in urban areas with strong considerations regarding contamination and pollution. Employment opportunities are with town, city, and state public works departments, private engineering consultants, architects, contractors, and many other engineering organizations. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170	GET 4171		Engineering Graphics 1, 2	8
		GET 4100	Comp. Prog. for Eng. Tech.	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
MTH 4121			Calculus 2	4
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
			Third Year	
CHM 4111			General Chemistry 1*	3
	ENG 4111		Critical Writing 2	3
		CET 4341	Fluid Mechanics	4
MET 4301			Mechanics A	4
	MET 4314	MET 4315	Stress Analysis A, B	8
ECN 4115	ECN 4116		Economic Principles and Problems 1, 2	6
			Fourth Year	
CET 4324			Structural Analysis 1	4
	CET 4350		Environmental 1	4
		CET 4393	Construction Administration	4
CET 4361			Materials and Soil Mechanics	4
	CET 4371		Concrete Design 1	4
		CET 4351	Environmental 2	4
			Total A.E. Degree	102

Note:

Associate degree graduates may transfer applicable credits toward the requirements in other School of Engineering Technology programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*Laboratory CHM 4117 required, See *University College Bulletin*.

Structural Engineering Technology (part-time)

Major Code 012

Leading to the Degree of Associate in Engineering

The program in Structural Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the planning, design, and supervision of the construction of buildings, bridges, foundations, flood-control projects, and all fixed structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The Mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170	GET 4171		Engineering Graphics 1, 2	8
		GET 4100	Comp. Prog. for Eng. Tech.	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
MTH 4121			Calculus 2	4
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
			Third Year	
CHM 4111			General Chemistry 1*	3
	ENG 4111		Critical Writing 2	3
		CET 4321	Intro. to Structural Design	4
MET 4301			Mechanics A	4
	MET 4314	MET 4315	Stress Analysis A, B	8
ECN 4115	ECN 4116		Economic Principles and Problems 1, 2	6
			Fourth Year	
CET 4324	CET 4325		Structural Analysis 1, 2	8
		CET 4393	Construction Administration	4
CET 4361			Materials and Soil Mechanics	4
	CET 4371		Concrete Design 1	4
		CET 4331	Steel Design 1	4
			Total A.E. Degree	102

Note:

Associate degree graduates may transfer applicable credits toward the requirements in other School of Engineering Technology programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*Laboratory CHM 4117 required, See *University College Bulletin*.

Surveying and Highway Engineering Technology (part-time)

Major Code 013

Leading to the Degree of Associate in Engineering

The program in Surveying and Highway Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects, such as subdivision work, individual lot layouts, and highway layouts, as well as more complex projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs, and aqueducts. Employment opportunities are with independent surveying companies, civil engineering companies, highway, transit, and railroad planning groups as well as cartographers, construction companies, and contractors. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 (courses MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170	GET 4171		Engineering Graphics 1, 2	8
		GET 4100	Comp. Prog. for Eng. Tech.	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
MTH 4121			Calculus 2	4
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
			Third Year	
CHM 4111			General Chemistry 1*	3
	ENG 4111		Critical Writing 2	3
		CET 4341	Fluid Mechanics	4
MET 4301			Mechanics A	4
	MET 4314	MET 4315	Stress Analysis A, B	8
ECN 4115	ECN 4116		Economic Principles and Problems 1, 2	6
			Fourth Year	
CET 4301			Plane Surveying	4
	CET 4302		Geodetic Surveying	4
		CET 4311	Highway Engineering	4
CET 4307			Legal Aspects of Surveying	4
	CET 4316		Land Use Planning	4
		CET 4303	Route Surveying	4
			Total A.E. Degree	102

Note:

Associate degree graduates may transfer applicable credits toward the requirements in other School of Engineering Technology programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*Laboratory CHM 4117 required, See *University College Bulletin*.

Civil Engineering Technology (part-time)

Major Code 014

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

The program in Civil Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design, and construction of all kinds of relatively permanent structures, municipal plants and systems, or transportation systems and facilities. Employment opportunities are in private consulting firms, construction companies, and public works agencies. Work involving surveying, design, and supervision is open to graduates. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		
Course Number			First Year	Q.H.
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
		GET 4100	Comp. Prog. for Eng. Tech.	4
GET 4170	GET 4171		Engineering Graphics 1, 2	8
Second Year				
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
MTH 4121	MTH 4122		Calculus 2, 3	8
		ENG 4110	Critical Writing 1	3
Third Year				
CHM 4111			General Chemistry 1*	3
	ENG 4111		Critical Writing 2	3
		MET 4315	Stress Analysis B	4
MET 4301			Mechanics A	4
	MET 4314		Stress Analysis A	4
		CET 4341	Fluid Mechanics	4
ECN 4115			Economic Principles and Problems 1	3
	SPC ()		Communications Elective	3
		GET 4306	Technical Communications 1	3
Fourth Year				
CET 4301			Plane Surveying	4
	CET 4302		Geodetic Surveying	4
		CET 4303	Route Surveying	4
()		()	Social Science/Hum. Elec.	6
CET 4324	CET 4325		Structural Analysis 1, 2	8
		CET 4321	Intro. to Structural Design	4

Note:

The preceding curriculum has been revised to meet accreditation requirements effective fall quarter 1986. Students not meeting matriculation criteria by January 1987 will be required to fulfill the revised curriculum.

Fall	Winter	Spring		
			Fifth Year	
CET 4361			Materials and Soil Mechanics	4
	CET 4350		Environmental 1	4
	CET 4371		Concrete Design 1	4
		CET 4372	Concrete Design 2	4
	()		Social Science/Hum. Elec.	3
		CET 4331	Steel Design 1	4
SPC ()			Communications Elective	3
			Sixth Year	
CET 4332			Steel Design 2	4
	()		Social Science/Hum. Elec.	3
		CET 4311	Highway Engineering	4
()	()	()	Social Science/Hum. Elec.	9
()	()	()	Laboratory Electives	6
			Seventh Year	
()	()	()	Technical Electives A, B, C	12
()	()	()	Technical Electives A, B, C	<u>12</u>
			Total B.E.T. Degree	188

	Suggested Technical Electives A	
CET 4307	Legal Aspects of Surveying	4
CET 4390	Technology of Modern Architecture	4
CET 4394	Civil Engineering Computer Application	4
IIS 4360	Engineering Economy	4
	Suggested Technical Electives B	
CET 4342	Hydraulics	4
CET 4316	Land Use Planning	4
CET 4391	Architectural Design 1	4
CET 4362	Soil Mechanics and Foundations	4
	Suggested Technical Electives C	
CET 4351	Environmental 2	4
CET 4393	Construction Administration	4
CET 4392	Architectural Design 2	4
	Suggested Laboratory Electives	
CET 4310 (Summers only)	Surveying Lab.	2
CET 4314 CET 4315	Surveying Practice 1, 2	4
CET 4352	Environmental Lab.	2
CET 4364	Materials and Soil Mechanics Lab.	2
MET 4390	Measurement and Analysis Lab.	2
MET 4391	Technology Lab. A	2

Note:

Before registering for any electives, the student should submit a proposed program of elective courses – preferably representing a minor field of concentration consistent with his or her personal career objectives – for approval by the Academic Standing Committee.

Elective courses for which proper preparation exists may be chosen from inside or outside the civil engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

*Laboratory CHM 4117 required, See *University College Bulletin*.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology. SPC () Communications Electives should be chosen from this approved Social Science/Humanities Electives list.

Mechanical-Structural Engineering Technology

Major Code 015

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it provides the opportunity for students to prepare themselves to assume responsibilities related both to the planning and construction of relatively static structures such as buildings, bridges, and docks, and also to the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content is integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test must be taken during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170		GET 4171	Engineering Graphics 1, 2	8
	GET 4100		Comp. Prog. for Eng. Tech.	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
MTH 4121			Calculus 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
			Third Year	
MTH 4122			Calculus 3	4
MET 4301	MET 4302		Mechanics A, B	8
		MET 4380	Materials A	4
	MET 4314		Stress Analysis A	4
		MET 4370	Fluid Mechanics A	4
CHM 4111			General Chemistry 1*	3
			Fourth Year	
MET 4315			Stress Analysis B	4
	MET 4371		Fluid Mechanics B	4
		CET 4321	Introduction to Structural Design	4
MET 4390			Measurement & Analysis Lab.	2
	MET 4391	MET 4392	Technology Laboratory A, B	4
		()	Social Science/Hum. Elec.	3
	ENG 4111		Critical Writing 2	3
ECN 4115			Economic Principles and Problems 1	3

Fall	Winter	Spring		
			Fifth Year	
MET 4303			Mechanics C	4
CET 4324	CET 4325		Structural Analysis 1, 2	8
		CET 4331	Steel Design 1	4
	()	()	Technical Electives	8
			Sixth Year	
CET 4332			Steel Design 2	4
	CET 4371	CET 4372	Concrete Design 1, 2	8
()	()	()	Social Science/Hum. Elec.	3
	()	()	Technical Electives	8
()	()		Social Science/Hum. Elec.	6
			Seventh Year	
	MET 4330	MET 4331	Mechanical Design A, B	8
()			Technical Elective	4
()		()	Social Science/Hum. Elec.	6
	()		Laboratory Elective	2
()	()		Social Science/Hum. Elec.	6
		()	Open Elective [†]	3
			Total B.E.T. Degree	186

	Suggested Technical Electives	
CET 4301	Plane Surveying	4
CET 4361	Materials & Soil Mechanics	4
CET 4362	Soil Mechanics & Foundations	4
CET 4393	Construction Administration	4
MET 4416	Stress Analysis C	4
MET 4340	Thermodynamics A	4
MET 4481	Materials B	4
MET 4482	Applied Metallurgy	4
MET 4414	Mechanical Vibrations	4
MET 4415	Experimental Stress Analysis	4
IIS 4393	Engineering Probability & Statistics	4
GET 4301	FORTTRAN Engineering Computation	4

Note:

Elective courses for which proper preparation exists may be chosen from inside or outside of the mechanical-structural engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Before registering for any electives, the student should submit a proposed program of elective courses – preferably representing a minor field of concentration consistent with his or her personal career objectives – for approval by the Academic Standing Committee. MTH 4122, MTH 4123 are recommended for all students planning advanced engineering technology subjects.

The above curriculum has been revised to meet accreditation requirements effective fall quarter 1986. Students not meeting matriculation criteria by January 1987 will be required to fulfill the revised curriculum.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology; 6 q.h. of this category must be taken from the Speech Communications (SPC) list.

*Laboratory CHM 4117 required, *See University College Bulletin.*

[†]Any course, except Physical Education, Military Science, and remedial courses, is acceptable as an Open Elective.

COMPUTER TECHNOLOGY PROGRAMS

Computer technology deals with the design and use of computer systems. Computer systems are made up of computer hardware and software. The computer hardware deals with the design and architecture of the computer system. Computer software deals with the method and application of problem solving, utilizing the hardware.

Each of the programs offered covers both areas. The student has the option to emphasize either area. This is accomplished by selecting the computer technical electives that deal with the chosen area.

Employment opportunities for Computer Technology graduates are many and varied in the computer industry. The graduate may work with computer hardware and/or software at various functional levels in the industry.

The Computer Technology programs offered by the School of Engineering Technology are:

Associate in Engineering Degree (part-time program)
Computer Technology

Bachelor of Engineering Technology (day/part-time program)
Computer Technology

Computer Technology (part-time) *Major Code 036*

Leading to the Degree of Associate in Engineering

The Computer Technology program offers students the opportunity to provide themselves with the mathematical and technological background for understanding both the hardware and software aspects of computer systems, and so will be prepared as: a) programmers who translate engineering, scientific, and business concepts into meaningful form for the computer; b) engineering technicians concerned with the development, specification, production, and operation of computer hardware; and c) applications technicians dealing with the interface of the computer with industrial process and control systems or data acquisition, reduction, and display systems. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
CT 4105			Introduction to Programming	4
	GET 4170		Engineering Graphics 1	4
		CT 4150	Computer Organization	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
MTH 4121			Calculus 2	4
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
			Third Year	
MTH 4122			Calculus 3	4
	CT 4310		Fortran	4
		EET 4311	Electronics 1	4
EET 4151	EET 4152		Circuits Analysis 1, 2	8
		ENG 4111	Critical Writing 2	3
			Fourth Year	
CT 4340			Modern Prog. Techniques	4
	CT 4345		Assembly Language	4
		CT 4374	Intro. to CPU Hardware	4
CT 4368			Semiconductor Logic	4
	CT 4369		Computer Logic	4
		CT 4311	Prog. with the "C" Language	4
		()	Social Science/Hum. Elec.	3
			Total A.E. Degree	100

Note:

Associate degree graduates may transfer applicable credits toward the requirements in other School of Engineering Technology programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology.

Computer Technology (part-time)

Major Code 037

Leading to the Degree of Bachelor of Engineering Technology

The Computer Technology program offers students the opportunity to prepare themselves to be knowledgeable in both hardware and software. The balance of hardware and software courses combined with hands-on laboratory experience provides the student with the opportunity to develop the skill for interfacing the computer with process plants or machinery. Other employment possibilities exist in programming the computer for engineering, scientific, and business applications; designing, engineering, and testing computers; and interfacing computers with various types of equipment for automated drafting, data collection, and display. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4110), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
CT 4105			Introduction to Programming	4
	GET 4170		Engineering Graphics 1	4
		CT 4150	Computer Organization	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
MTH 4121			Calculus 2	4
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
			Third Year	
MTH 4122			Calculus 3	4
	CT 4310		Fortran	4
		EET 4311	Electronics 1	4
EET 4151	EET 4152		Circuits Analysis 1, 2	8
		ENG 4111	Critical Writing 2	3
		()	Social Science/Hum. Elec.	3
			Fourth Year	
CT 4340			Modern Prog. Techniques	4
	CT 4345		Assembly Language	4
		CT 4374	Introduction to CPU Hardware	4
CT 4368			Semiconductor Logic	4
	CT 4369		Computer Logic	4
		()	Social Science/Hum. Elec.	3

Fall	Winter	Spring		
			Fifth Year	
CT 4375			CPU Architecture	4
	CT 4330		Nonnumerical Algorithms	4
		CT 4355	Micro Peripheral Hardware	4
CT 4311			Prog. with the "C" Language	4
	CT ()		Computer Technical Elective	4
		ECN 4115	Economic Principles and Problems 1	3
	()	()	Social Science/Hum. Elec.	6
			Sixth Year	
CT 4356			Complex Peripheral Hardware	4
	CT 4335		Numerical Algorithms	4
		CT 4380	Data Communication Methods	4
CT ()			Computer Technical Elective	4
	CT 4351		Advanced Computer Org.	4
		()	Social Science/Hum. Elec.	3
		()	Social Science/Hum. Elec.	3
			Seventh Year	
CT 4360			Industry Software	4
	CT 4365		Industry Hardware	4
		CT ()	Computer Technical Elective	4
()			Technical Elective	4
	()		Technical Elective	4
		()	Social Science/Hum. Elec.	3
		()	Social Science/Hum. Elec.	3
			Total B.E.T. Degree	180

Computer Technical Electives

CT 4312	PL/1 A Programming Language	4
CT 4320	COBOL	4
CT 4321	Programming with "ADA"	4
CT 4348	LISP	4
CT 4363	Concurrent Programming	4
CT 4377	VLSI Design	4
CT 4379	Networking	4
CT 4381	Operating Systems	4
CT 4382	Computer Graphics Programming	4
CT 4383	Data Bases	4
CT 4384	Large System Assembly Languages	4
CT 4385	Introduction to Simulation Programming	4
CT 4387	Bit Slice Micro Computers	4
CT 4389	Single Chip Microprocessors	4
CT 4390	Special Problems in Computer Technology	4

Note:

All other technical electives may be chosen from other engineering technology or science disciplines within the School of Engineering Technology subject to the program coordinator's approval.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology.

Computer Technology (day)

Major Code 080

Leading to the Degree of Bachelor of Engineering Technology

First Year

Quarter 1			Quarter 2		
MTH 1191	College Algebra	4	MTH 1192	Pre-Calculus	4
PHY 1191	Physics 1	4	PHY 1192	Physics 2	4
ENG 1110	Fresh. Eng. 1	4	ENG 1111	Fresh. Eng. 2	4
GET 1170	Eng. Graphics 1	4	CT 1105	Intro. to Prog.	4
			PHY 1194	Physics Lab. 1	2
Quarter 3					
MTH 1193	Calculus 1	4			
PHY 1193	Physics 3	4			
ENG 1114	Fresh. Tech. Writg.	4			
CT 1150	Comp. Organiz.	4			
PHY 1195	Physics Lab. 2	2			

Second Year

Quarter 4			Quarter 5		
MTH 1194	Calculus 2	4	MTH 1195	Calculus 3	4
EET 1151	Circuit Analysis 1	4	EET 1152	Circuit Analysis 2	4
ECN 1115	Princ. of -		CT 1311	Prog. with "C"	
	Macroeconomics	4		Language	4
CT 1310	Fortran	4	()	Soc. Sci./Hum. Elec.	4

Third Year

Quarter 6			Quarter 7		
EET 1311	Electronics 1	4	CT 1330	Non-Numerical	
CT 1340	Modern Prog. Tech.	4		Algorithms	4
CT 1345	Assembly Language	4	CT 1374	Intro. to CPU Hardware	4
ENG 1340	Writing Workshop	1	CT 1368	Semiconductor Logic	4
()	Soc. Sci./Hum. Elec.	4	()	Soc. Sci./Hum. Elec.	4

Fourth Year

Quarter 8			Quarter 9		
CT 1375	CPU Architecture	4	CT 1355	Micro Peripheral Hdwre.	4
CT 1335	Numerical Algorithms	4	CT 1380	Data Comm. Methods	4
CT 1369	Computer Logic	4	CT ()	Computer Tech. Elec.	4
CT ()	Computer Tech. Elec.	4	()	Technical Elective	4

Quarter 10			Quarter 11		
CT 1356	Complex Peripheral Hdwre.	4	CT 1365	Industry Hardware	4
CT 1360	Industry Software	4	CT 1351	Adv. Computer Organiz.	4
CT ()	Computer Tech. Elec.	4	()	Technical Elective	4
()	Soc. Sci./Hum. Elec.	4	()	Soc. Sci./Hum. Elec.	4
Total B.E.T. Degree					181

Computer Technical Electives

CT 1381	Operating Systems	4
CT 1382	Computer Graphics Programming	4
CT 1383	Data Bases	4
CT 1384	Large System Assembly Language	4
CT 1385	Introduction to Simulation Programming	4
CT 1387	Bit Slice Micro Computers	4
CT 1389	Single Chip Microprocessors	4
CT 1390	Special Problems in Computer Technology	4

Middler Year Writing Requirement

Beginning with the class of 1989, all day students will be required to fulfill the Middler Year Writing Requirement (MYWR) during the middler year.

Note:

All other technical electives may be chosen from other engineering technology or science disciplines within the Basic College, subject to the department chair-person's approval.

Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

Social Science/Humanities Electives may be chosen from a list that is available from the School of Engineering Technology.

All external transfer day students entering the University with eighty or more credits must complete the MYWR during one of the first two quarters they are enrolled at Northeastern. No transfer credits for writing courses or examinations taken at previous institutions may be applied toward the requirement.

The School of Engineering Technology requires students to take the Writing Workshop (ENG 1340). This is a one credit, pass/fail writing course in which the student writes a long paper, often in conjunction with another course. The Writing Workshop is an interdisciplinary course that provides an orientation to word processing.

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

The electrical engineering profession deals with the design and operation of equipment and systems related to power, communications, data processing, and electrical control. Its major functions are: 1) the generation, transmission, and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar, and communication; 3) the design and construction of data processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, engineering consulting groups with industrial and plant applications, design organizations dealing with operation and manufacture, sales engineering, and the electric utility industry. Job opportunities will depend on the economy and the individual's abilities.

The Electrical Engineering Technology program and related programs offered by the School of Engineering Technology are:

Associate in Engineering Degree (part-time program)
Electrical Engineering Technology

Bachelor of Engineering Technology Degree (day/part-time programs)
Electrical Engineering Technology
(Accredited by the Technology Accreditation Commission of the
Accreditation Board for Engineering and Technology)

Electrical Engineering Technology (part-time) *Major Code 033*

Leading to the Degree of Associate in Engineering

The program in Electrical Engineering Technology offers the student the opportunity to assume responsibilities related to the design, development, and operation of communications, data processing, and electronic control equipment for applications in computers, military and space explorations, and in automated industrial production equipment. Employment opportunities are in communications equip-

ment, electrical manufacturing, data processing and control, equipment organizations, as well as other engineering-oriented companies. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement exam during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170		GET 4172	Eng. Graphics 1, E. E. Graphics	8
	GET 4100		Comp. Prog. for Eng. Tech.	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
MTH 4121			Calculus 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
			Third Year	
MTH 4122	MTH 4123		Calculus 3, Diff. Equations*	8
		()	Social Science/Hum. Elec.	3
EET 4151	EET 4152		Circuit Analysis 1, 2	8
		ENG 4111	Critical Writing 2	3
	EET 4124	EET 4125	Circuits Laboratory 1, 2	4
			Fourth Year	
EET 4311	EET 4312	EET 4313	Electronics 1, 2, 3	12
EET 4353	EET 4354		Circuit Analysis 3 [†] , 4 [‡]	8
		EET 4310	Electrical Measurements	4
		EET 4323	Electronics Laboratory	2
	()		Social Science/Hum. Elec.	3
			Total A.E. Degree	105

Note:

Associate degree graduates may transfer applicable credits toward the requirements in other School of Engineering Technology programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Social Science/Humanities Electives are offered through University College and may be chosen from a list that is available from the School of Engineering Technology.

The above curriculum has been revised to meet accreditation requirements effective fall quarter 1986. Students not meeting matriculation criteria by January 1987 will be required to fulfill the revised curriculum.

*Social Science/Humanities Elective may substitute for MTH 4123.

†EET 4314 may substitute for EET 4353.

‡Technical elective may substitute for EET 4354.

Electrical Engineering Technology (part-time)

Major Code 035

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

The program in Electrical Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to the design, development, operating, installation, and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, electric utilities, electrical and electronic organizations concerned with operation, manufacture, installation, and sales. Job opportunities will also depend on the economy and the student's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170		GET 4172	Eng. Graphics 1, E. E. Graphics	8
	GET 4100		Comp. Prog. for Eng. Tech.	4
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
MTH 4121			Calculus 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
			Third Year	
MTH 4122	MTH 4123		Calculus 3, Diff. Equations	8
		()	Social Science/Hum. Elec.	3
EET 4151	EET 4152		Circuit Analysis 1, 2	8
		ENG 4111	Critical Writing 2	3
	EET 4124	EET 4125	Circuits Laboratory 1, 2	4
			Fourth Year	
EET 4311	EET 4312	EET 4313	Electronics 1, 2, 3	12
EET 4353	EET 4354		Circuit Analysis 3, 4	8
		EET 4310	Electrical Measurements	4
		EET 4323	Electronics Laboratory	2
()			Social Science/Hum. Elec.	3
			Fifth Year	
EET 4314			Pulse & Digital 1	4
	EET ()		Technical Elective	4
		MET 4319	Mechanics	4
		EET 4330	Energy Conversion	4
SPC ()	SPC ()		Communication Electives	6
EET 4327	EET 4328		Adv. Electronics Labs. 1, 2	4

Fall	Winter	Spring		
			Sixth Year	
EET 4370	EET 4371		Digital Computers 1, 2	8
		EET 4337	Distributed Systems	4
()	()	()	Social Science/Hum. Elec.	9
		EET ()	Technical Elective	4
()			Open Elective*	3
		EET 4329	Adv. Electronics Lab. 3	2
			Seventh Year	
EET ()	EET ()		Technical Electives	8
	EET 4377	EET 4378	Control Engineering 1, 2	8
()	()	()	Social Science/Hum. Elec.	9
			Total B.E.T. Degree	186
			Suggested Technical Electives	
MET 4340			Thermodynamics	4
MET 4380			Materials A	4
EET 4391			Basic Optics and Optical Systems Design	4
EET 4392			Optoelectronics and Fiber Optics	4
EET 4315			Pulse & Digital 2	4
EET 4317	EET 4318	EET 4319	Principles of Communication Systems 1, 2, 3	12
EET 4362	EET 4363	EET 4364	Basic Power Systems 1, 2, 3	12
IIS 4360			Engineering Economy 1	4
IIS 4393			Eng. Prob. & Statistics	4
GET 4301			Fortran Eng. Computation	4
CT 4374			Intro. to CPU Hardware	4
CT 4375			CPU Architecture	4

Note:

Electrical Engineering Technology courses of an elective nature may be chosen from the above list of courses.

Elective courses for which proper preparation exists may be chosen from inside or outside the electrical engineering discipline.

Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his or her personal career objectives—for approval by the Academic Standing Committee.

EET 4341, EET 4342, EET 4343 Power & Control Labs. 1, 2, 3 may be substituted for EET 4327, EET 4328, EET 4329 Advanced Electronic Labs. 1, 2, 3.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology.

SPC () Communications Electives should be chosen from this approved Social Science/Humanities Electives list.

The preceding curriculum has been revised to meet accreditation requirements effective fall quarter 1986. Students not meeting matriculation criteria by January 1987 will be required to fulfill the revised curriculum.

*Any course, except Physical Education, Military Science, and preparatory courses, is acceptable as an Open Elective.

Electrical Engineering Technology (day)

Major Code 083

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

First Year

Quarter 1			Quarter 2		
MTH 1191	College Algebra	4	MTH 1192	Pre-Calculus	4
PHY 1191	Physics 1	4	PHY 1192	Physics 2	4
ENG 1110	Fresh. Eng. 1	4	ENG 1111	Fresh. Eng. 2	4
GET 1170	Eng. Graphics 1	4	GET 1100	Computer Prog.	4
			PHY 1194	Physics Lab. 1	2
Quarter 3					
MTH 1193	Calculus 1	4			
PHY 1193	Physics 3	4			
ENG 1114	Fresh. Tech. Writing	4			
GET 1171	Eng. Graph. 2	4			
PHY 1195	Physics Lab. 2	2			

Second Year

Quarter 4			Quarter 5		
MTH 1194	Calculus 2	4	MTH 1195	Calculus 3	4
EET 1151	Circuit Analysis 1	4	EET 1152	Circuit Analysis 2	4
ECN 1115	Principles of Economics	4	MET 1319	Mechanics	4
()	Soc. Sci./Hum. Elec.	4	()	Soc. Sci./Hum. Elec.	4
			EET 1124	Circuit Lab. 1	2

Third Year

Quarter 6			Quarter 7		
EET 1353	Circuit Analysis 3	4	EET 1354	Circuit Analysis 4	4
EET 1311	Electronics 1	4	EET 1312	Electronics 2	4
EET 1360	Engineering Analysis	4	EET 1310	Electrical Measurements	4
EET 1125	Circuit Lab. 2	2	EET 1323	Electronics Lab.	2
SPC ()	Communication Elective	4	ENG 1340	Writing Workshop	1

Fourth Year

Quarter 8			Quarter 9		
EET 1313	Electronics 3	4	EET 1314	Pulse & Digital 1	4
EET ()	Technical Elective	4	EET ()	Technical Elective	4
()	Soc. Sci./Hum. Elec.	4	()	Soc. Sci./Hum. Elec.	4
EET 1330	Energy Conversion	4	EET 1337	Distributed Systems	4
EET 1327	Adv. Electronics Lab. 1	2	EET 1328	Adv. Electronics Lab. 2	2

Fifth Year

Quarter 10			Quarter 11		
EET 1377	Control Engineering 1	4	EET 1378	Control Engineering 2	4
EET 1370	Digital Computers 1	4	EET 1371	Digital Computers 2	4
EET ()	Technical Elective	4	EET ()	Technical Elective	4
EET 1329	Adv. Electronics Lab. 3	2	()	Soc. Sci./Hum. Elec.	4
()	Open Elective*	4			
					<hr/>
					Total B.E.T. Degree
					189
Suggested Technical Electives					
MET 1340	MET 1341		Thermodynamics A, B		8
MET 1380	MET 1381		Materials A, B		8
EET 1315			Pulse & Digital 2		4
EET 1317	EET 1318	EET 1319	Principles of Communication Systems 1, 2, 3		12
EET 1362	EET 1363	EET 1364	Basic Power Systems 1, 2, 3		12
EET 1390			Optical Instrumentation		4
CHT 1381			Nuclear Technology		4

Middler Year Writing Requirement

Beginning with the class of 1989, all day students will be required to fulfill the Middler Year Writing Requirement (MYWR) during the middler year.

All external transfer day students entering the University with eighty or more credits must complete the MYWR during one of the first two quarters they are enrolled at Northeastern. No transfer credits for writing courses or examinations taken at previous institutions may be applied toward the requirement.

The School of Engineering Technology requires students to take the Writing Workshop (ENG 1340). This is a one credit, pass/fail writing course in which the student writes a long paper, often in conjunction with another course. The Writing Workshop is an interdisciplinary course that provides an orientation to word processing.

Note:

This curriculum is in effect beginning with the class of 1990.

Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

Graduates of the day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information, contact the School of Engineering Technology office at 120 Snell Engineering Center, telephone 437-2500.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology.

SPC () Communication Electives should be chosen from this approved Social Science/Humanities Electives list.

*Any course, except Physical Education, Military Science, and preparatory courses, is acceptable as an Open Elective.

MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

The mechanical engineering profession deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering, which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices that are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery, from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces, boilers, and heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of: 1) research, design, or development; 2) production, operation, testing, or control; 3) installation, maintenance, and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically so as to function independently and in positions of managerial responsibility. Job opportunities will also depend on the economy and the individual's abilities.

The Mechanical Engineering Technology program and related programs offered by the School of Engineering Technology are:

Associate in Engineering Degree (part-time program)
Mechanical Engineering Technology

Bachelor of Engineering Technology Degree (day/part-time program)
Mechanical Engineering Technology (Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)
Aerospace Maintenance Engineering Technology (day/part-time program)

Mechanical Engineering Technology (part-time)

Major Code 021

Leading to the Degree of Associate in Engineering

The program in Mechanical Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, production, and installation of mechanical tools, machinery, engines, and transportation equipment in which there is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, in light and heavy industries, and in almost all engineering design organizations. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		
Course Number			First Year	Q.H.
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170		GET 4171	Engineering Graphics 1, 2	8
	GET 4100		Comp. Prog. for Eng. Tech.	4
Second year				
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
MTH 4121			Calculus 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
Third Year				
MTH 4122			Calculus 3	4
	GET 4364		Kinematics	4
		MET 4380	Materials A	4
MET 4301	MET 4302		Mechanics A, B	8
		MET 4314	Stress Analysis A	4
CHM 4111			General Chemistry 1*	3
Fourth Year				
MET 4315			Stress Analysis B	4
	MET 4340		Thermodynamics A	4
		MET 4370	Fluid Mechanics A	4
MET 4390			Meas. & Analysis Lab.	2
	MET 4391	MET 4392	Technology Laboratory A, B	4
		()	Social Science/Hum. Elec.	3
	ENG 4111		Critical Writing 2	3
ECN 4115			Economic Prin. & Prob. 1	3
Total A.E. Degree				104

Note:

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology.

The preceding curriculum has been revised to meet accreditation requirements effective fall quarter 1986. Students not meeting matriculation criteria by January 1987 will be required to fulfill the revised curriculum.

*Laboratory CHM 4117 required. See *University College Bulletin*.

Mechanical Engineering Technology (part-time)

Major Code 023

(Accredited by the Technology Accreditation Commission of the Accreditation Board of Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to the design, development, production, operation, and installation of all kinds of machinery, engines, and transportation equipment, as well as boilers, furnaces, and heating or air-conditioning equipment that involve interactions of mechanical, hydraulic, and thermodynamic forces. Employment opportunities are in industry producing mechanized and automated equipment, in design and engineering organizations, and in companies dealing primarily with manufacture and production. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement examination during class. Some students may be requested to register for Elements in Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		
Course Number			First Year	Q.H.
MTH 4107			College Algebra	4
	MTH 4108		Pre-Calculus	4
		MTH 4120	Calculus 1	4
GET 4170		GET 4171	Engineering Graphics 1, 2	8
	GET 4100		Comp. Prog. for Eng. Tech.	4
Second Year				
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
MTH 4121			Calculus 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications 1	3
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
Third Year				
MTH 4122			Calculus 3	4
	GET 4364		Kinematics	4
		MET 4380	Materials A	4
MET 4301	MET 4302		Mechanics A, B	8
		MET 4314	Stress Analysis A	4
CHM 4111			General Chemistry 1*	3*
Fourth Year				
MET 4315			Stress Analysis B	4
	MET 4340		Thermodynamics A	4
		MET 4370	Fluid Mechanics A	4
MET 4390			Meas. & Analysis Lab.	2
	MET 4391	MET 4392	Technology Laboratory A, B	4
		()	Social Sciences/Hum. Elec. [†]	3
	ENG 4111		Critical Writing 2	3
ECN 4115			Economic Prin. & Prob. 1	3

Fall	Winter	Spring		
Course Number			Fifth Year	
MET 4303			Mechanics C	4
	MET 4341		Thermodynamics B	4
		MET 4342	Refrigeration & Air Cond.	4
IIS 4360			Engineering Economy	4
	MET 4371		Fluid Mechanics B	4
		MET 4481	Materials B	
		or		
		MET 4416	Stress Analysis C	4
			Sixth Year	
MET 4343			Heat Transfer	4
	MET 4330	MET 4331	Mechanical Design A, B	8
MET 4393	MET 4394	MET 4395	Technology Laboratory C, D, E	6
()	()	()	Social Science/Hum. Elec. [†]	9
			Seventh Year	
()	()	()	Technical Electives	12
()		()	Social Science/Hum. Elec. [†]	6
	EET 4120		Electricity & Electronics	4
()	()		Social Science/Hum. Elec. [†]	6
		()	Open Elective [‡]	3
			Total B.E.T. Degree	186

Suggested Technical Electives

CET 4301	Plane Surveying	4
CET 4331	Steel Design 1	4
CET 4371	Concrete Design	4
MET 4416	Stress Analysis C	4
MET 4481	Materials B	4
MET 4482	Applied Metallurgy	4
MET 4414	Mechanical Vibrations	4
MET 4415	Experimental Stress Analysis	4
MET 4444	Power Generation	4
EET 4321	Electricity and Electronics 2	4
GET 4301	Fortran Engineering Computation	4

Note:

Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his or her personal career objectives—for approval by the Academic Standing Committee.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 Richards Hall). Programs in electrical and mechanical engineering are available on a part-time as well as a regular day cooperative program. Industrial, chemical, and computer science engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

MTH 4123 Differential Equations is recommended for all students planning advanced engineering technology subjects.

Associate degree graduates may transfer applicable credits toward the requirements in other School of Engineering Technology programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

The preceding curriculum has been revised to meet accreditation requirements effective fall quarter 1986. Students not meeting matriculation criteria by January 1987 will be required to fulfill the revised curriculum.

*Laboratory CHM 4117 required. See *University College Bulletin*.

†Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology; 6 q.h. of the Social Science/ Humanities Electives must be taken from the approved (SPC) Speech Communications Electives.

‡Any course, except Physical Education, Military Science, and remedial courses, is acceptable as an Open Elective.

Mechanical Engineering Technology (day)

Major Code 082

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

First Year

Quarter 1			Quarter 2		
MTH 1191	College Algebra	4	MTH 1192	Pre-Calculus	4
PHY 1191	Physics 1	4	PHY 1192	Physics 2	4
ENG 1110	Fresh. Eng. 1	4	PHY 1194	Physics Lab. 1	2
GET 1170	Eng. Graphics 1	4	ENG 1111	Fresh. Eng. 2	4
	or		GET 1100	Computer Prog.	4
GET 1100	Computer Prog.	4		or	
			GET 1170	Eng. Graphics 1	4
Quarter 3					
MTH 1193	Calculus 1	4			
PHY 1193	Physics 3	4			
ENG 1114	Fresh. Tech. Writing	4			
GET 1171	Eng. Graph. 2	4			
PHY 1195	Physics Lab. 2	2			

Second Year

Quarter 4			Quarter 5		
MTH 1194	Calculus 2	4	MTH 1195	Calculus 3	4
GET 1364	Kinematics	4	MET 1302	Mechanics B	4
MET 1301	Mechanics A	4	MET 1314	Stress Analysis A	4
EET 1320	Electricity & Electronics	4	CHM 1131	General Chemistry	4

Third Year

Quarter 6			Quarter 7		
ENG 1340	Writing Workshop	1	MET 1380	Materials A	4
MET 1315	Stress Analysis B	4	MET 1391	Tech. Lab. A	2
MET 1390	Meas. & Analysis Lab.	2	MET 1341	Thermodynamics B	4
MET 1340	Thermodynamics A	4	MET 1370	Fluid Mechanics A	4
MET 1303	Mechanics C	4	()	Soc. Sci./Hum. Elec.	4
ECN 1115	Prin. of Macroeconomics	4			

Fourth Year

Quarter 8			Quarter 9		
MET 1330	Mechanical Design A	4	MET 1331	Mechanical Design B	4
MET 1392	Tech. Lab. B	2	MET 1393	Tech. Lab. C	2
MET 1371	Fluid Mechanics B	4	MET 1342	Refrig. & Air Cond.	4
()	Soc. Sci./Hum. Elec.	4	()	Soc. Sci./Hum. Elec.	4
MET 1396	Machine Shop	4	()	Technical Elective	4
	or				
IIS ()	Technical Elective	4			

Fifth Year

Quarter 10			Quarter 11		
MET 1394	Tech. Lab. D	2	MET 1395	Tech. Lab. E	2
IIS 1356	Engineering Economy	4	MET 1343	Heat Transfer	4
()	Soc. Sci./Hum. Elec.	4	()	Open Elective	4
()	Technical Elective	4	()	Soc. Sci./Hum. Elec.	4
MET 1481	Materials B	4			
	or				
MET 1416	Stress Analysis C	4			
Total B.E.T. Degree					189

Technical Electives Must Be Chosen from the Following List:

MET 1416	Stress Analysis C	4
MET 1415	Exp. Stress Analysis	4
MET 1414	Mech. Vibrations	4
MET 1481	Materials B	4
MET 1482	Applied Metallurgy	4
MET 1444	Power Generation	4
EET 1321	Electricity & Electronics II	4
EET 1360	Engineering Analysis	4
EET 1390	Optical Instrumentation	4
CHT 1381	Nuclear Technology	4

Middler Year Writing Requirement

Beginning with the class of 1989, all day students will be required to fulfill the Middler Year Writing Requirement (MYWR) during the middler year.

All external transfer day students entering the University with eighty or more credits must complete the MYWR during one of the first two quarters they are enrolled at Northeastern. No transfer credits for writing courses or examinations taken at previous institutions may be applied toward the requirement.

The School of Engineering Technology requires students to take the Writing Workshop (ENG 1340). This is a one credit, pass/fail writing course in which the student writes a long paper, often in conjunction with another course. The Writing Workshop is an interdisciplinary course that provides an orientation to word processing.

Note:

This curriculum is in effect beginning with the class of 1990.

Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

Any course, except Physical Education, Military Science, and preparatory courses, is acceptable as an Open Elective.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology; 4 q.h. of the Social Science/Humanities Electives must be taken from the approved (SPC) Speech Communications Electives.

Aerospace Maintenance Engineering Technology (part-time)
Major Code 098

Leading to the Degree of Bachelor of Engineering Technology

The Bachelor of Engineering Technology degree is awarded to students who complete the East Coast Aero Technical School airframe and powerplant technical curriculum, or its equivalent, and the five-year program plus four prerequisite courses at the School of Engineering Technology. The prerequisite School of Engineering Technology courses are MTH 4107 College Algebra, MTH 4108 Pre-Calculus, MTH 4120 Calculus 1 and CHM 4111 General Chemistry 1 (15 q.h.). Refer to the *University College Bulletin* for the CHM 4111 General Chemistry 1 course description. These courses are taken prior to entering the program.

Fall	Winter	Spring	First Year	Q.H.
Course Number			Prerequisite Courses	15
			East Coast Aero Technical School (or equiv.)	48
GET 4170			Engineering Graphics 1	4
	GET 4100		Comp. Prog. for Eng. Tech.	4
		GET 4171	Engineering Graphics 2	4
MTH 4121			Calculus 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications	3
			Second Year	
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
()		()	Soc. Sci./Hum. Elec.	6
	ENG 4111		Critical Writing 2	3
			Third Year	
MET 4301	MET 4302		Mechanics A, B	8
		MET 4314	Stress Analysis A	4
MTH 4122			Calculus 3	4
	MET 4340		Thermodynamics A	4
		MET 4380	Materials A	4

For the last two years choose Curriculum A or B.
Curriculum A

			Fourth Year	
MET 4315			Stress Analysis B	4
		MET 4370	Fluid Mechanics A	4
	ECN 4115		Economic Prin. & Prob. 1	3
MET 4390			Meas. and Analysis Lab.	2
()		()	Soc. Sci./Hum. Elec.	6
	MET 4391		Technology Lab. A	2
	EET 4120		Electricity and Electronics 1	4

Fall	Winter	Spring		
Course Number			Fifth Year	
MET ()	MET ()		Technical Electives	8
		MET 4481	Materials B	4
()	()	()	Soc. Sci./Hum. Elec.	9
		()	Soc. Sci./Hum. Elec.	3
	()		Open Elective	3
Total B.E.T. Degree				186

Curriculum B

			Fourth Year	
MET 4390			Meas. and Analysis Lab.	2
		MET 4370	Fluid Mechanics A	4
ECN 4115			Economic Prin. and Prob. 1	3
	MET 4341		Thermodynamics B	4
()		()	Soc. Sci./Hum. Elec.	6
	EET 4120		Electricity and Electronics 1	4
Fifth Year				
MET 4393			Technology Lab. C	2
MET ()	MET ()		Technical Electives	8
		MET 4481	Materials B	4
()	()	()	Soc. Sci./Hum. Elec.	9
		()	Soc. Sci./Hum. Elec.	3
	()		Open Elective	3
Total B.E.T. Degree				186

Suggested Technical Electives:

Same as Mechanical Engineering Technology.

Note:

The preceding curriculum has been revised to meet accreditation requirements effective fall quarter 1986. Students not meeting matriculation criteria by January 1987 will be required to fulfill the revised curriculum.

Any course, except Physical Education, Military Science, and remedial courses, is acceptable as an Open Elective.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology; 6 q.h. of the Social Science/Humanities Electives must be taken from the approved (SPC) Speech Communications Electives.

Aerospace Maintenance Engineering Technology (day)

Major Code 081

Leading to the Degree of Bachelor of Engineering Technology

The Bachelor of Engineering Technology degree is awarded to students who complete the East Coast Aero Technical School Airframe and Powerplant technical curriculum, or its equivalent, and seven quarters plus four prerequisite courses at the School of Engineering Technology. The *prerequisite* School of Engineering Technology courses are MTH 1191 College Algebra, MTH 1192 Pre-Calculus, MTH 1193 Calculus 1 and CHM 1131 General Chemistry 1 (16 q.h.). These courses are taken prior to entering the program.

Prerequisite Courses	16
East Coast Aero Technical School (or equiv.)	48

First Year

Quarter 1			Quarter 2		
GET 1170	Eng. Graphics 1	4	GET 1100	Computer Prog.	4
MTH 1194	Calculus 2	4	()	Soc. Sci./Hum. Elec.	4
PHY 1191	Physics 1	4	PHY 1192	Physics 2	4
ENG 1110	Fresh. Eng. 1	4	ENG 1111	Fresh. Eng. 2	4
			PHY 1194	Physics Lab. 1	2
Quarter 3					
GET 1171	Eng. Graphics 2	4			
MTH 1195	Calculus 3	4			
PHY 1193	Physics 3	4			
ENG 1114	Fresh. Tech. Writg.	4			
PHY 1195	Physics Lab. 2	2			

Second Year

Quarter 4			Quarter 5		
MET 1301	Mechanics A	4	MET 1302	Mechanics B	4
EET 1320	Electricity & Electronics	4	MET 1314	Stress Analysis A	4
MET 1340	Thermodynamics A	4	MET 1380	Materials A	4
ECN 1115	Princ. of Macroeconomics	4	** ()	Soc. Sci./Hum. Elec.	4
ENG 1340	Writing Workshop	1			

Third Year

Quarter 6			Quarter 7		
MET 1481	Materials B	4	MET 1370	Fluid Mechanics A	4
MET 1390	Meas. & Anal. Lab.	2	()	Technical Elective	4
()	Technical Elective	4	()	Soc. Sci./Hum. Elec.	4
()	Soc. Sci./Hum. Elec.	4	()	Soc. Sci./Hum. Elec.	4
()	Open Elective	4	MET 1391	Technology Lab. A	2
MET 1315	Stress Analysis B	4	or		
	or		MET 1393	Technology Lab. C	2
MET 1341	Thermodynamics B	4			
Total B.E.T. Degree					189

Middler Year Writing Requirement

Beginning with the class of 1989, all day students will be required to fulfill the Middler Year Writing Requirement (MYWR) during the middler year.

All external transfer day students entering the University with eighty or more credits must complete the MYWR during one of the first two quarters they are enrolled at Northeastern. No transfer credits for writing courses or examinations taken at previous institutions may be applied toward the requirement.

The School of Engineering Technology requires students to take the Writing Workshop (ENG 1340). This is a one credit, pass/fail writing course in which the student writes a long paper, often in conjunction with another course. The Writing Workshop is an interdisciplinary course that provides an orientation to word processing.

Note:

This curriculum is in effect beginning with the class of 1990.

Match MET 1391 Technology Laboratory A with MET 1315 Stress Analysis B.

Match MET 1393 Technology Laboratory C with MET 1341 Thermodynamics B.

Suggested Technical Electives: Same as Mechanical Engineering Technology.

Any course, except Physical Education, Military Science, and preparatory courses, is acceptable as an Open Elective.

Social Science/Humanities Electives should be chosen from a list that is available from the School of Engineering Technology; 4 q.h. of the Social Science/Humanities Electives must be taken from the approved (SPC) Speech Communications Electives.

ASSOCIATE IN SCIENCE TECHNOLOGY PROGRAMS

These programs offered by the School of Engineering Technology present a variety of interdisciplinary combinations of the engineering technology programs. They have been developed to meet the need for technologists in the areas of telecommunications, energy systems, and other technological applications requiring an expertise in several of the academic disciplines.

This demand for multi-skilled technologists reflects the increased reliance of society on the science and engineering technologist to help solve its growth problems. Other interdisciplinary programs are offered by the school and are described in preceding sections. They are the Computer Technology and the Mechanical-Structural Engineering Technology majors.

The programs are designed to offer the student the opportunity to prepare to meet the challenge of interfacing technology and society. The engineering technology student not only learns about related disciplines, but also becomes oriented in the disciplines to which his or her technological skills will be applied.

Associate in Science programs offered to School of Engineering Technology students are:

Associate in Science (part-time program)

Energy Systems

Telecommunications

Energy Systems (part-time)

Leading to the Degree of Associate in Science

In the past few years the phrase *Energy Conservation* has become a household word in both domestic and industry/business energy system applications. The technology involved with the more efficient use of energy systems is progressing dramatically as this country strives to become energy self-sufficient. This progress is evident in the search for more efficient use of solar, geothermal, hydroelectric, and wind energies as they are being developed. This innovative associate degree program will give students the opportunity to gain the necessary training to enter this field as qualified technologists. Classroom instruction coupled with laboratory experience will help develop the mathematics-science-english core into a viable career-oriented energy systems curriculum.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 course (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement exam during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

The first two years of the associate degree program are shown below. Refer to updated curriculum sheets in the School of Engineering Technology, 120 Snell Building, telephone 617-437-2500, for the last two years.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
GET 4170			Engineering Graphics 1	4
	MTH 4108		Pre-Calculus	4
	GET 4100		Comp. Prog. for Eng. Tech.	4
		MTH 4120	Calculus 1	4
		MET 4344	Energy Systems Theory & Hydronics	4
			Second Year	
MTH 4121			Calculus 2	4
PHY 4117			Physics 1	4
	PHY 4118		Physics 2	4
	PHY 4173		Physics Laboratory 1	2
	ENG 4110		Critical Writing 1	3
		PHY 4119	Physics 3	4
		PHY 4174	Physics Laboratory 2	2
		GET 4306	Technical Communications	3
			Total	50

Telecommunications (part-time)

Major Code 038

Leading to the Degree of Associate in Science

The program in Telecommunications offers students the opportunity to prepare to assume responsibilities relating to the electronic transfer of information through voice, data, or video media using electronic signals in wires, light waves in optic fibers, or radio waves in the earth's atmosphere. Employment opportunities are with telephone, data processing, radio transmission/receiving, cable television, and computer equipment, software, and service industries.

Prerequisite: Satisfactory completion of the mathematics placement test or the Introductory Mathematics 1 and 2 courses (MTH 4081 and MTH 4082). The mathematics placement test is given during the first class of MTH 4107 College Algebra.

Each student in Critical Writing 1 (ENG 4110) will take a placement exam during class. Some students may be requested to register for Elements of Writing (ENG 4011), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring		Q.H.
Course Number			First Year	
MTH 4107			College Algebra	4
EET 4180			Intro. to Telecommunications	4
	MTH 4108		Pre-Calculus	4
	GET 4138		Intro. Prog. for Telecomm.	4
		MTH 4120	Calculus 1	4
		GET 4170	Engineering Graphics 1	4
			Second Year	
MTH 4121			Calculus 2	4
PHY 4117	PHY 4118	PHY 4119	Physics 1, 2, 3	12
	PHY 4173	PHY 4174	Physics Laboratory 1, 2	4
	ENG 4110		Critical Writing 1	3
		GET 4306	Technical Communications	3
			Third Year	
EET 4151	EET 4152		Circuit Analysis 1, 2	8
EET 4384			Video Communications	4
	EET 4124	EET 4125	Circuit Laboratory 1, 2	4
	ECN 4115		Economic Prin. & Prob. 1	3
		EET 4381	Telecomm. Systems 1	4
		ENG 4111	Critical Writing 2	3
			Fourth Year	
EET 4311			Electronics 1	4
EET 4382	EET 4383		Telecomm. Systems 2, 3	8
	EET 4312		Electronics 2	4
		EET 4310	Electrical Measurements	4
		EET 4323	Electronic Laboratory	2
		MGT 4101	Intro. to Business & Mgmt. 1	3
			Total A.S. Degree	101

Description of Courses

On the following pages is a numerical and descriptive listing of courses offered in the several curricula of the School of Engineering Technology. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum, except for those special courses as defined in the departmental heading of the following course descriptions. The term *prerequisite* indicates a course that must be taken before undertaking the advanced courses to which it applies.

A "quarter hour" equals approximately three clock hours of work (approximately fifty minutes of class and two hours of preparation a week for a quarter of twelve weeks' duration). Laboratory and drawing courses normally carry less credit than lecture courses.

Abbreviations

prereq. — prerequisite
coreq. — corequisite
cl. — class hours
lab. — laboratory hours
q.h. — quarter hours

Course Number Format Example: CET* 4[†]301[‡]

*Department Designator

[†]1 = Day Curriculum

4 = Evening Curriculum

[‡]Course Number

001-099 Compensatory Course

100-299 Lower Level (i.e., Freshman and Sophomore Course)

300-699 Upper Level Courses

Policy on Changes of Program

The School of Engineering Technology reserves the right to cancel, modify, or add to the courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

Index to Courses

<i>Pages</i>	<i>Dept.</i> <i>Designator</i>	
83	CET	Civil Engineering Technology
86	CHT	Chemical Engineering Technology
86	CT	Computer Technology
93	EET	Electrical Engineering Technology
101	GET	General Engineering Technology
103	IIS	Industrial Engineering Technology
104	MET	Mechanical Engineering Technology
111	MTH	Mathematics
113	PHY	Physics
114	TCC	Technical Communications

Civil Engineering Technology

CET 4301 Plane Surveying (4 cl., 4 q.h.)

Surveying principles; theory of measurements; leveling; traverse computations; area calculation; stadia principles and topography. *Prereq.* MTH 4108.

CET 4302 Geodetic Surveying (2 cl., 4 lab., 4 q.h.)

Introduction to practical astronomy for surveying, including basic spherical trigonometry. Introduction to geodetic surveying, including precise leveling, triangulation, EDM equipment, and base line measurements. *Prereq.* CET 4301.

CET 4303 Route Surveying (4 cl., 4 q.h.)

Simple and compound curves; vertical curves; earthwork computations; solution of the mass diagram; introduction to route location by photogrammetry. *Prereq.* CET 4301.

CET 4307 Legal Aspects of Surveying (4 cl., 4 q.h.)

Registry of deeds and probate; ownership of land; deeds, descriptions of qualifying expression; adverse possession; Massachusetts land court; expert witness. *Prereq.* CET 4301.

CET 4310 Surveying Laboratory (3 lab., 2 q.h.)

An outdoor lab in use of level, transit, and plane table. Level circuits and a transit-table traverse are run. Topography and layout problems are given. *Prereq.* CET 4301.

CET 4311 Highway Engineering (4 cl., 4 q.h.)

Engineering considerations in the planning and construction of modern highways and highway routing; traffic flow and traffic control; computer applications to transportation problems. *Prereq.* CET 4301.

CET 4314 Surveying Practice 1 (1 cl., 2 lab., 2 q.h.)

Computing and balancing a control traverse; calculating exact property lines, vertical control survey; plotting from topographic field notes. *Prereq.* CET 4303.

CET 4315 Surveying Practice 2 (1 cl., 2 lab., 2 q.h.)

Scale drawing of the proposed subdivision; calculations required by the land court for the subdivision; street profiles showing grades; drainage study. *Prereq.* CET 4314.

CET 4316 Land Use Planning (4 cl., 4 q.h.)

Environmental, sociological, economic aspects, and traditional basis for land use planning. Objectives, content, form and preparation of plan. Community and public facilities, transportation; environmental impact and plan implementation. *Prereq.* GET 4171.

CET 4321 Introduction to Structural Design (2 cl., 4 lab., 4 q.h.)

Tabular methods for the design of members and connections using the AISI Code. *Prereq.* MET 4314, GET 4171.

CET 4324 Structural Analysis 1 (4 cl., 4 q.h.)

Reactions, shears, bending moments, and forces developed by loading systems on beams and trusses. Influence lines for beams, girders and trusses; solutions for forces from moving load systems on statically determinate structures. *Prereq.* MET 4315.

CET 4325 Structural Analysis 2 (4 cl., 4 q.h.)

Classical methods of deflection solution for beams and trusses. Methods of solving statically indeterminate structures. *Prereq.* CET 4324.

CET 4331 Steel Design 1 (4 cl., 4 q.h.)

Design of steel members in structural frames; tension, compression, bending and eccentrically loaded members. Design of plate girders for buildings. *Prereq.* CET 4321, MET 4315.

CET 4332 Steel Design 2 (4 cl., 4 q.h.)

Design of steel for highway bridges, composite design in bridges and buildings, introduction to plastic analysis and design in steel. *Prereq.* CET 4331.

CET 4341 Fluid Mechanics (4 cl., 4 q.h.)

Hydrostatics; pressure measurement; hydrostatic forces on submerged areas; simple dams; fluid dynamics; kinematics of flow; continuity, momentum and energy equations; orifices; Pi theorem; laminar and turbulent flow. *Prereq.* MET 4314.

CET 4342 Hydraulics (4 cl., 4 q.h.)

Flow in closed conduits; empirical formulas for closed conduit flow; minor losses; compound pipe systems; open channel flow; specific energy and stage relationships; fluid measurement systems; hydraulic machinery. *Prereq.* CET 4341.

CET 4350 Environmental 1 (4 cl., 4 q.h.)

Principles of water supply engineering; population forecasting; quality and quantity of water for various uses. Water treatment processes. Collection and disposal of waste water and storm water; modern treatment methods and waste water plant operation. *Prereq.* CHM 4111 and CET 4341.

CET 4351 Environmental 2 (2 cl., 4 lab., 4 q.h.)

Layout and design of water treatment and sewage treatment plants. Instrumentation and electrical equipment. Laboratory demonstrations. *Prereq.* CET 4350.

CET 4352 Environmental Lab. (3 lab., 2 q.h.)

Methods and techniques for the physical, chemical, and bacteriological examination of water and waste water, and approaches to treatment through bench scale studies. *Prereq.* CET 4350.

CET 4354 Advanced Industrial Waste Water Treatment (4 cl., 4 q.h.)

Environmental analysis, microbiology, biological treatment principles and applications physical/chemical treatment, unit processes and operations, process trouble shooting regulatory requirements, source reduction and hazardous waste considerations. *Prereq.* CET 4355 or CET 4356 or permission.

CET 4355 Biological Industrial Waste Treatment Operation (4 cl., 4 q.h.)
Operating principles and procedures of biological waste treatment as applied to industrial wastewaters. Process calculations, controls, performance evaluation, monitoring and microbiology will be stressed along with operational problem definition and solution. *Prereq.* CET 4350 or equiv.

CET 4356 Physical-Chemical Industrial Waste Treatment Operations (4 cl., 4 q.h.)
Operational principles and procedures of the physical-chemical waste treatment process are covered. Chemistry related to precipitation, neutralization, oxidation-reduction, carbon absorption will be reviewed as well as operation of ion exchange, reverse osmosis and other membrane. Clarification and other solids separation methods will be studied along with sludge treatment options. *Prereq.* CET 4350 or equiv.

CET 4361 Materials and Soil Mechanics (4 cl., 4 q.h.)
Physical properties of portland cement, aggregates, mixing water and admixtures; batch proportioning; bituminous materials; index properties of soils, soil moisture and structure; compressibility, theory of consolidation. *Prereq.* MET 4315.

CET 4362 Soil Mechanics and Foundations (4 cl., 4 q.h.)
Shear strength of soils, distribution of stress; settlement computations; lateral earth pressures; bearing capacity; soil compaction, soil stabilization, and site investigation. *Prereq.* CET 4361.

CET 4364 Materials and Soil Mechanics Lab. (3 lab., 2 q.h.)
Grain size analysis; specific gravity; CBR optimum moisture; direct shear; seepage and flow nets; consolidation test. *Prereq.* CET 4361.

CET 4371 Concrete Design 1 (4 cl., 4 q.h.)
Design of bending members, axially and eccentrically loaded columns by elastic and ultimate strength principles. *Prereq.* MET 4315.

CET 4372 Concrete Design 2 (4 cl., 4 q.h.)
Reinforced concrete design of basic structures, including considerations of continuity. Introduction to prestressed concrete member design. *Prereq.* CET 4371.

CET 4390 Technology of Modern Architecture (4 cl., 4 q.h.)
General background of architectural styles, both historical and contemporary, with emphasis on engineering design and construction procedures required for the various types of buildings. *Prereq.* None.

CET 4391 Architectural Design 1 (4 cl., 4 q.h.)
Basic architectural design concepts; proportion, scale form, massing, color texture, and lighting. Orientation of structures; site organization; selection of building materials. *Prereq.* GET 4371, CET 4390.

CET 4392 Architectural Design 2 (4 cl., 4 q.h.)
Consideration of the building process. Individual architectural design projects assigned by the instructor. *Prereq.* CET 4391.

CET 4393 Construction Administration (4 cl., 4 q.h.)
Contracts, specifications, and bidding procedures; estimating and scheduling, including critical path; discussion of personnel administration and union negotiation. Bid preparation for a small project. *Prereq.* None.

CET 4394 Civil Engineering Computer Applications (4 cl., 4 q.h.)
An introduction to the systems approach to typical civil engineering problems and their solution using computer applications. *Prereq.* CET 4325, CET 4350, CET 4361, CET 4303.

Chemical Engineering Technology

CHT 1381 Nuclear Technology (4 cl., 4 q.h., Day Curriculum)

Atomic and nuclear structure; discovery and nature of radioactivity; nuclear reactions and energy; induced nuclear transformation; neutron properties; nuclear instrumentation for particle detection, monitoring, and experimentation; the fission process and its applications; nuclear reactors—their classification, design, and application; supplementary laboratory experiments. *Prereq.* MTH 1195, PHY 1193.

Computer Technology

CT 1105 Introduction to Programming (4 cl., 4 q.h.) (Day Curriculum)

The PASCAL language as an introduction to the solution of problems using the computer. Topic: problem solving, flowcharting, structured programs, loops, counters and procedures. The student will use the University's computer facilities to run program assignments. *Prereq.* None.

CT 1150 Computer Organization (4 cl., 4 q.h.) (Day Curriculum)

Fundamental aspects of basic computer components. Includes the function and basic operation of CPU's, main memory and secondary memory. The functions of an operating system and its relationship with a program. *Prereq.* CT 1105 or CT 4105. (This course is not open to students who have taken CT 1341 or CT 4150).

CT 1310 FORTRAN (4 cl., 4 q.h.) (Day Curriculum)

FORTRAN 77 as a second language with emphasis on structured programming and modularity. Topics: lists, matrices, subroutines, functions, character-data manipulation, file processing, and documentation. The student will use the University's computer facilities to run program assignments. *Prereq.* CT 1105 or CT 4105.

CT 1311 Programming with the "C" Language (4 cl., 4 q.h.) (Day Curriculum)

Students write programs in "C," a general-purpose programming language usable for operating systems or numerical, text-processing, and data-base programs. A basic knowledge of programming fundamentals is assumed. Topics: basic data types; operators and expressions; control-flow (if-else, while, etc.); functions and program structure; external variables; scope rules; pointers; address arithmetic; structure and union; and the "C" I/O Library. *Prereq.* CT 1105 or CT 4105.

CT 1320 COBOL (4 cl., 4 q.h.) (Day Curriculum)

The COBOL language through its applications in business problems. The elementary topics of COBOL are covered quickly, and the emphasis is on the more advanced topics. Topics: table handling, sorting, sequential, index, random and dynamic file processing. An extensive real type project is a vital part of the course. *Prereq.* CT 1310 or CT 4310.

CT 1330 Nonnumerical Algorithms (4 cl., 4 q.h.) (Day Curriculum)

Data: structures, storage, manipulation, and retrieval methods. Students will write and run data manipulation programs using the University's computer facilities. Topics: stacks, queues, lists, trees, heaps, sets, graphs, hashing, searching, sorting, key processing, relational models. *Prereq.* CT 1105 or CT 4105.

CT 1335 Numerical Algorithms (4 cl., 4 q.h.) (Day Curriculum)
Computer methods for solving mathematical problems. Students write and run application programs using the University's computer facilities. Topics: deterministic vs. stochastic methods, random number generators, iterative vs. noniterative solutions, maxima and minima in 2 and 3 variables, curve fitting in 2 and 3 variables, integrals, trapezoidal and Simpson's rules, slopes, difference equations in 2 and 3 variables, vector and matrix algebra, simultaneous linear equations, nonlinear equations, permutations, and combinations. *Prereq.* CT 1310 or CT 4310.

CT 1340 Modern Programming Techniques (4 cl., 4 q.h.) (Day Curriculum)
Structured methods for developing complex computer software. Students develop structured specifications, structured designs, and the computer programs for complex problems. Students test the programs on the University's computer facilities. Topics: Partitioning, hierarchical organization, data flow diagrams, data dictionaries, structured English, decision trees, decision tables, structured charts, team design, structured programs, maintainability. *Prereq.* CT 1310 or CT 4310.

CT 1345 Assembly Language (4 cl., 4 q.h.) (Day Curriculum)
A typical microprocessor assembly language. Students write and run homework problems on microprocessor-based systems. Topics: CPU and system programming model, instruction sets, addressing modes, binary operations, code conversion, subroutines, macros, I/O. *Prereq.* CT 1150 or CT 4150.

CT 1351 Advanced Computer Organization (4 cl., 4 q.h.) (Day Curriculum)
The functional characteristics of complex and special purpose computer systems. The functions of a general purpose multi-user, multi-processing operating system. Advanced topics include virtual memory and virtual machine architectures; distributed and multi-processor systems; array processors and system performance analysis. *Prereq.* CT 1356 or CT 4356 and CT 1375 or CT 4375. (This course is not open to students who have taken CT 1342 or CT 4351).

CT 1355 Micro Peripheral Hardware (4 cl., 4 q.h.) (Day Curriculum)
The elements of microprocessor peripheral hardware and its interfacing. Students design and analyze microprocessor systems, including detailed schematics, timing diagrams, and technical documentation. Topics: serial I/O devices, DMA and interrupt control devices, standard buses, bus arbitration techniques, bus support VLSI. *Prereq.* CT 1374 or CT 4374.

CT 1356 Complex Peripheral Hardware (4 cl., 4 q.h.) (Day Curriculum)
The interfacing and implementation of complex peripheral systems. Topics: disc and tape interfaces; graphic display devices; communication interfaces and subsystems; and I/O processors. *Prereq.* CT 1355 or CT 4355.

CT 1360 Industry Software (4 cl., 4 q.h.) (Day Curriculum)
A survey of current commercial software packages and methods. Students exercise commercial packages implemented on the University's computer facilities where applicable. Topics: specific packages and methods that vary from year to year to maintain currency. They will be drawn from the following general categories: data-base management, scientific and statistical analysis, security and privacy, software assurance, and documentation. *Prereq.* CT 1310 or CT 4310.

CT 1365 Industry Hardware (4 cl., 4 q.h.) (Day Curriculum)
A survey of the latest industrial developments and trends in computer hardware. Conducted as a seminar. *Prereq.* CT 1356 or CT 4356.

CT 1368 Semiconductor Logic (4 cl., 4 q.h.) (Day Curriculum)
A detailed analysis of the bipolar and MOS transistors in saturated and cutoff conditions and implementation of these concepts to form basic logic circuits and standard logic families. Students will convert logical expressions into hardware configuration representations. Topics: Ebers-Moll modeling, PMOS, NMOS, CMOS, bipolar characteristics, standard logic families. *Prereq.* EET 1311 or EET 4311.

CT 1369 Computer Logic (4 cl., 4 q.h.) (Day Curriculum)

An introduction to the hardware building blocks of digital computers. Students will specify configurations of gates and memory components to achieve combinational and sequential composite logical functions. Finite state machine design and analysis. Topics: gates, flip-flops, registers, decoders, ALU's, memory arrays, synchronous and asynchronous state machines. *Prereq.* CT 1368 or CT 4368.

CT 1374 Introduction to CPU Hardware (4 cl., 4 q.h.) (Day Curriculum)

An introduction to the circuits and operation of a microcomputer. A study of the microprocessor and its basic support components and circuits including detailed timing and functional analysis of their interactions. Topics: central processing unit, memory, addressing, clocking, bus concepts, interrupts, coprocessors, I/O, and instruction timing. *Prereq.* CT 1345 or CT 4345 and CT 1368 or CT 4368.

CT 1375 CPU Architecture (4 cl., 4 q.h.) (Day Curriculum)

High performance microprocessor architecture and hardware interfacing techniques. Current commercial processors and their support components are analyzed. Topics: internal CPU architecture, memory management, instruction prefetch, privilege states, bus cycles, control lines, I/O, interrupts, exceptions, pipelining. *Prereq.* CT 1374 or CT 4374.

CT 1380 Data Communication Methods (4 cl., 4 q.h.) (Day Curriculum)

Introduction to the ISO Open Systems Interconnect model for communication system. Functional and operational aspects of data communication devices and software. A black box approach will be used. Topics: modems, control units, multiplexers, concentrators, front end processors and error checking. *Prereq.* CT 1356 or CT 4356.

CT 1381 Operating Systems (4 cl., 4 q.h.) (Day Curriculum)

The basic principles and organization of operating system implementation. Topics: processor management, process multiplexing and synchronization, schedules, atomic operations and mutual exclusion, sequential and concurrent programming, memory, device and data management. *Prereq.* CT 1150 or CT 4150.

CT 1382 Computer Graphics Programming (4 cl., 4 q.h.) (Day Curriculum)

Introduction to generalized techniques for the computer plotting of 2- and 3-dimensional shapes. Students write and run programs using the University's computer and digital plotter. Topics: 2D transforms, 3D to 2D transforms, 3D transforms, surface representation, shading, hidden line, raster technology-color, introduction to interactive graphics, characters, curve fitting, graphic data structures. *Prereq.* GET 1100 or GET 4100.

CT 1383 Data Bases (4 cl., 4 q.h.) (Day Curriculum)

An introduction to data-base organization structure and management. Students write and run programs exemplifying techniques developed in class using the University's computer facilities. Topics: access methods, attributes, indices, keys, querying, searching and matching, file sets, inverted file sets, normal forms, random access. *Prereq.* CT 1330 or CT 4330.

CT 1384 Large System Assembly Languages (4 cl., 4 q.h.) (Day Curriculum)

VAX-11 assembly language Macro to show how basic components in the CPU are used during program execution. Topics: integer, real and character instruction sets, various address techniques, procedure linkage, main and system I/O. The student will use the University's computer facilities to run program assignments. *Prereq.* CT 1345 or CT 4345.

CT 1385 Introduction to Simulation Programming (4 cl., 4 q.h.) (Day Curriculum)

Computer methods for solving simulated phenomena. Students write and run programs implementing simulations specified by instructor. Students will not be responsible for the validity or evaluation of models except in simple cases. Topics: simple queues, multi-server queues, priorities including first in first out, last in first out, and time aging of data, simple frequency distributions, use of SIMULA, GPSS, and Standard Subroutine Library Routines. *Prereq.* CT 1335 or CT 4335.

CT 1387 Bit Slice Micro Computers (4 cl., 4 q.h.) (Day Curriculum)
The epitome of hardware flexibility is represented by the bit slice CPU. Demonstrates the basic design ground rules common to this style of hardware design.
Prereq. CT 1355 or CT 4355.

CT 1389 Single Chip Microprocessors (4 cl., 4 q.h.) (Day Curriculum)
When small 8-bit intelligent devices are rewired in high volume, the single chip microprocessor in the form of the 3870, 8084, Z8, and others come into play. An understanding of the hardware limitations of a single chip system presents the basis for this subject material. *Prereq.* CT 1374 or CT 4374.

CT 1390 Special Problems in Computer Technology (4 cl., 4 q.h.) (Day Curriculum)
Theoretical or experimental work under individual faculty supervision.
Prereq. Consent of department chairperson.

CT 4105 Introduction to Programming (4 cl., 4 q.h.)
The PASCAL language as an introduction to the solution of problems using the computer. Topics: problem solving, flowcharting, structured programs, loops, counters and procedures. The student will use the University's computer facilities to run program assignments. *Prereq.* None.

CT 4150 Computer Organization (4 cl., 4 q.h.)
Fundamental aspects of basic computer components. Includes the function and basic operation of CPU's, main memory and secondary memory. The functions of an operating system and its relationship with a program. *Prereq.* CT 4105 or CT 1105.

CT 4310 FORTRAN (4 cl., 4 q.h.)
FORTAN 77 as a second language with emphasis on structured programming and modularity. Topics: lists, matrices, subroutines, functions, character-data manipulation, file processing, and documentation. The student will use the University's computer facilities to run program assignments. *Prereq.* CT 4105 or CT 1105.

CT 4311 Programming with the "C" Language (4 cl., 4 q.h.)
Students write programs in "C," a general-purpose programming language usable for operating systems or numerical, text-processing, and data-base programs. A basic knowledge of programming fundamentals is assumed. Topics: basic data types; operators and expressions; control-flow (if-else, while, etc.); functions and program structure; external variables; scope rules; pointers; address arithmetic; structure and union; and the "C" I/O Library. *Prereq.* CT 4310 or CT 1310.

CT 4312 PL/1 A Programming Language (4 cl., 4 q.h.)
Students will learn to use PL/1 as another programming language, they will write programs with the PL/1 language and run the programs on a computer system using, string manipulation, pointers, storage classes, and conditions. . . . use of PL/1 as a source language in compiler design. *Prereq.* CT4105 or CT1105.

CT 4320 COBOL (4 cl., 4 q.h.)
The COBOL language through its applications in business problems. The elementary topics of COBOL are covered quickly and the emphasis is on the more advanced topics. Topics: table handling, sorting, sequential, index, random and dynamic file processing. An extensive real type project is a vital part of the course. *Prereq.* CT 1310 or CT 4310.

CT 4321 Programming with "ADA" (4 cl., 4 q.h.)

ADA is a programming language for numerical applications, system programming applications, and applications with real-time and concurrent execution requirements. Topics: readability, strong typing, programming in the large, exception handling, data abstraction, tasking, and generic units. The student will use the University's computer facilities to write programs dealing with numerical and system programming applications. *Prereq.* CT 4105, CT 4311, GET 4100 or knowledge of PASCAL, C, or FORTRAN.

CT 4330 Non-numerical Algorithms (4 cl., 4 q.h.)

Data: structures, storage, manipulation, and retrieval methods. Students write and run data manipulation programs using the University's computer facilities. Topics: stacks, queues, lists, trees, heaps, sets, graphs, hashing, searching, sorting, key processing, relational models. *Prereq.* CT 4105 or CT 1105.

CT 4335 Numerical Algorithms (4 cl., 4 q.h.)

Computer methods for solving mathematical problems. Students write and run application programs using the University's computer facilities. Topics: deterministic vs. stochastic methods, random number generators, iterative vs. noniterative solutions, maxima and minima in 2 and 3 variables, curve fitting in 2 and 3 variables, integrals, trapezoidal and Simpson's rules, slopes, difference equations in 2 and 3 variable, vector and matrix algebra, simultaneous linear equations, nonlinear equations, permutations, and combinations. *Prereq.* CT 4310 or CT 1310.

CT 4340 Modern Programming Techniques (4 cl., 4 q.h.)

Structured methods for developing complex computer software. Students develop structured specifications, structured designs, and the computer programs for complex problems. Students test the programs using the University's computer facilities. Topics: Partitioning, hierarchical organization, data flow diagrams, data dictionaries, structured English, decision trees, decision tables, structured charts, team design, structured programs, maintainability. *Prereq.* CT 4310 or CT 1310.

CT 4345 Assembly Language (4 cl., 4 q.h.)

A typical microprocessor assembly language. Students write and run homework problems on microprocessor-based systems. Topics: CPU and system programming model, instruction sets, addressing modes, binary operations, code conversion, subroutines, macros, I/O. *Prereq.* CT 4105 or CT 1105 and CT 4150 or CT 1150.

CT 4348 LISP (4 cl., 4 q.h.)

Introduction to an interactive language in which the LISP interpreter is commonly referred to as the read-evaluate-print loop. Since the style of LISP programming is different from that of "normal" programming, a great deal of time will be devoted to discussing its various levels of implementation. LISP is an excellent medium for implementing standard techniques in data structure manipulation; also techniques for recursion, complex data structures, storage management, and symbol table manipulation. *Prereq.* CT 4311 or CT 1311 and CT 4330 or CT 1330.

CT 4351 Advanced Computer Organization (4 cl., 4 q.h.)

The functional characteristics of complex and special purpose computer systems. The functions of a general purpose multi-user, multi-processing operating system. Advanced topics: virtual memory and virtual machine architectures; distributed and multi-processor systems; array processors and system performance analysis. *Prereq.* CT 4356 or CT 1356 and CT 4375 or CT 1375.

CT 4355 Micro Peripheral Hardware (4 cl., 4 q.h.)

The elements of microprocessor peripheral hardware and its interfacing. Students design and analyse microprocessor systems, including detailed schematics, timing diagrams, and technical documentation. Topics: serial I/O devices, DMA and interrupt control devices, standard buses, bus arbitration techniques, bus support VLSI. *Prereq.* CT 4374 or CT 1374.

CT 4356 Complex Peripheral Hardware (4 cl., 4 q.h.)

The interfacing and implementation of complex peripheral systems. Topics: disc and tape interfaces; graphic display devices; communication interfaces and sub-systems; and I/O processors. *Prereq.* CT 4355 or CT 1355.

CT 4360 Industry Software (4 cl., 4 q.h.)

A survey of current commercial software packages and methods. Students exercise commercial packages implemented on the University's computer facilities where applicable. Topics: specific packages and methods that vary from year to year to maintain currency. They will be drawn from the following general categories: data base management, scientific and statistical analysis, security and privacy, software assurance, and documentation. *Prereq.* CT 4310 or CT 1310.

CT 4363 Concurrent Programming

The basic principles of concurrent programming. Students will write and run programs to demonstrate various aspects of concurrent programming techniques and issues. Topics: correctness of concurrent programs, mutual exclusion, timing Dekker's algorithms, the producer-consumer problem, monitors, semaphores, "Ada Rendezvous", critical regions and conditional variables. *Prereq:* experience in either PASCAL or "C".

CT 4365 Industry Hardware (4 cl., 4 q.h.)

A survey of the latest industrial developments and trends in computer hardware. Conducted as a seminar. *Prereq.* CT 4356 or CT 1356.

CT 4368 Semiconductor Logic (4 cl., 4 q.h.)

A detailed analysis of the bipolar and MOS transistors in saturated and cutoff conditions. Implementation of these concepts to form basic logic circuits and standard logic families. Students convert logical expressions into hardware configuration representations. Topics: Ebers-Moll modeling, PMOS, NMOS, CMOS, bipolar characteristics, standard logic families. *Prereq.* EET 4311 or EET 1311.

CT 4369 Computer Logic (4 cl., 4 q.h.)

An introduction to the hardware building blocks of digital computers. Students specify configurations of gates and memory components to achieve combinational and sequential composite logical functions. Finite state machine design and analysis. Topics: gates, flip-flops, registers, decoders, ALU's, memory arrays, synchronous and asynchronous state machines. *Prereq.* CT 4368 or CT 1368.

CT 4374 Introduction to CPU Hardware (4 cl., 4 q.h.)

An introduction to the circuits and operation of a microcomputer. A study of the microprocessor and its basic support components and circuits, including detailed timing and functional analysis of their interactions. Topics: central processing unit, memory, addressing, clocking, bus concepts, interrupts, coprocessors, I/O, and instruction timing. *Prereq.* CT 4345 or CT 1345 and CT 4368 or CT 1368.

CT 4375 CPU Architecture (4 cl., 4 q.h.)

High performance microprocessor architecture and hardware interfacing techniques. Current commercial processors and their support components are analyzed. Topics: internal CPU architecture, memory management, instruction prefetch, privilege states, bus cycles, control lines, I/O, interrupts, exceptions, pipelining. *Prereq.* CT 4374 or CT 1374.

CT 4377 VLSI Design (4 cl., 4 q.h.)

Very Large Scale Integration (VLSI) Integrated Circuits (ICs) are the key components of all modern computers. An introduction to MOS devices, circuits, design methods, and fabrication techniques used in producing custom VLSI IC's. Topics include MOS transistor characteristics; basic gate circuits; scaling; layout tools, both manual and automated; wafer fabrication techniques; standards; testing; and costs. *Prereq.* CT 4369 or CT 1369.

CT 4379 Networking (4 cl., 4 q.h.)

An introduction to the functional and operational aspects of computer networks. Topics: the ISO Reference Model's seven layers, ARPANET, DECNET, and SNA. *Prereq.* CT 4380 or CT 1380.

CT 4380 Data Communications Methods (4 cl., 4 q.h.)

Introduction to the ISO Open Systems Interconnect model for communication system. Functional and operational aspects of data communication devices and software. A black box approach will be used. Topics: modems, control units, multiplexers, concentrators, front end processors and error checking. *Prereq.* CT 4356 or CT 1356.

CT 4381 Operating Systems (4 cl., 4 q.h.)

The basic principles and organization of operating system implementation. Topics: processor management, process multiplexing and synchronization, schedules, atomic operations and mutual exclusion, sequential and concurrent programming, memory, device and data management. *Prereq.* CT 4150 or CT 1150.

CT 4382 Computer Graphics Programming (4 cl., 4 q.h.)

Introduction to generalized techniques for the computer plotting of 2- and 3-dimensional shapes. Students write and run programs using the University's computer and digital plotter. Topics: 2D transforms, 3D to 2D transforms, 3D transforms, surface representation, shading, hidden line, raster technology-color, introduction to interactive graphics, characters, curve fitting, graphic data structures. *Prereq.* GET 4100 or GET 1100.

CT 4383 Data Bases (4 cl., 4 q.h.)

An introduction to data-base organization structure and management. Students write and run programs exemplifying techniques developed in class, using the University's computer facilities. Topics: access methods, attributes, indices, keys, querying, searching and matching, file sets, inverted file sets, normal forms, random access. *Prereq.* CT 4330 or CT 1330.

CT 4384 Large System Assembly Languages (4 cl., 4 q.h.)

VAX-11 assembly language Macro to show how basic components in the CPU are used during program execution. Topics: integer, real and character instruction sets, various addressing techniques, procedure linkage, main and system I/O. The student uses the university's computer facilities to run program assignments. *Prereq.* CT 4345 or CT 1345.

CT 4385 Introduction to Simulation Programming (4 cl., 4 q.h.)

Computer methods for solving simulated phenomena. Students write and run programs implementing simulations specified by instructor. Students will not be responsible for the validity or evaluation of models except in simple cases. Topics: simple queues, multi-server queues. Priorities including first in first out, last in last out, and time aging of data, simple frequency distributions, use of SIMULA, GPSS, and Standard Subroutine Library Routines. *Prereq.* CT 4335 or CT 1335.

CT 4387 Bit Slice Micro Computers (4 cl., 4 q.h.)

The epitome of hardware flexibility is represented by the bit slice CPU. The basic design ground rules common to this style of hardware design. *Prereq.* CT 4355 or CT 1355.

CT 4389 Single Chip Microprocessors (4 cl., 4 q.h.)

When small 8-bit intelligent devices are rewired in high volume, the single chip microprocessor in the form of the 3870, 8048, Z8, and others comes into play. An understanding of the hardware limitations of a single chip system presents the basis for this subject material. *Prereq.* CT 4374 or CT 1374.

CT 4390 Special Problems in Computer Technology (4 cl., 4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

EET 1124 Circuits Laboratory (3 lab., 2 q.h.) (Day Curriculum)

Experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications. *Prereq.* EET 1151 or EET 4151. This course is not open to students who have taken EET 1324.

EET 1125 Circuits Laboratory 2 (3 lab., 2 q.h.) (Day Curriculum)

Further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, nonlinear devices, terminal characteristics of active devices, log modulus plots, network parameters, and synthesis. Fourier analysis and synthesis. *Prereq.* EET 1124 or EET 4124. This course is not open to students who have taken EET 1325.

EET 1151 Circuits Analysis 1 (4 cl., 4 q.h.) (Day Curriculum)

Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, mesh and nodal analysis, network theorems, two-port networks and power relations – all with respect to direct currents; energy storage, singularity functions, response of R, L, and C elements to singularities. *Prereq.* MTH 1193 or MTH 4120 and PHY 1193 or PHY 4119.

EET 1152 Circuits Analysis 2 (4 cl., 4 q.h.) (Day Curriculum)

Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq.* EET 1151 or EET 4151.

EET 1310 Electrical Measurements (4 cl., 4 q.h.) (Day Curriculum)

Standards of measurement, dimensional analysis, errors and measurement of dispersed data, discrete and continuous variables, binomial distribution, normal distribution, guaranteed error, methods of resistance measurements, digital voltmeters and analog to digital conversion, voltage references, potentiometers and a.c. bridges. *Prereq.* EET 1353 or EET 4353.

EET 1311 Electronics 1 (4 cl., 4 q.h.) (Day Curriculum)

Semiconductor diodes and applications, transistor biasing techniques, graphical analysis of basic amplifiers, d.c. and a.c. load lines. *Prereq.* EET 1152 or EET 4152.

EET 1312 Electronics 2 (4 cl., 4 q.h.) (Day Curriculum)

Small-signal, low-frequency transistor models, gains, and impedances at mid-band, frequency effects in transistor circuits, multistage circuits, transistors used as current sources. *Prereq.* EET 1311 or EET 4311.

EET 1313 Electronics 3 (4 cl., 4 q.h.) (Day Curriculum)

Review of Bode plots, transistor circuits at low and high frequencies, feedback, operational amplifiers, differential amplifiers, applications. *Prereq.* EET 1312 or EET 4312.

EET 1314 Pulse & Digital 1 (4 cl., 4 q.h.) (Day Curriculum)

Switching characteristics of semiconductor devices; logic gates and the logic families ECL, MOS, Schottky TTL; speed limitations; concepts of waveshaping and wave generating circuits including comparators, Schmitt trigger, and relaxation oscillators. *Prereq.* EET 1311 or EET 4311.

EET 1315 Pulse & Digital 2 (4 cl., 4 q.h.) (Day Curriculum)

Topics include digital operations; logic statements and theorems; minimization of logic functions; flip-flops, counters, registers, and static and dynamic memory; introduction to sequential circuit design; sample and hold circuits; A-D and D-A conversion. *Prereq.* EET 1314 or EET 4314.

EET 1317 Principles of Communication Systems 1 (4 cl., 4 q.h.) (Day Curriculum)

Signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers including wideband; transistor power amplifiers AF and RF; oscillators; signal sources and applications. *Prereq. EET 1313 or EET 4313.*

EET 1318 Principles of Communication Systems 2 (4 cl., 4 q.h.) (Day Curriculum)

Basic theory of amplitude, frequency, phase and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; modems. *Prereq. EET 1317 and EET 4317.*

EET 1319 Principles of Communication Systems 3 (4 cl., 4 q.h.) (Day Curriculum)

Fundamentals of digital communications; sampling requirements; analog to digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, PWM; time and frequency division multiplexing; data decoding; selected examples from telemetry and computer links. *Prereq. EET 1318 or EET 4318.*

EET 1320 Electricity and Electronics (4 cl., 4 q.h.) (Day Curriculum)

Introduction to circuit analysis, resistive networks, periodic excitation function, steady state a-c circuits; the physical foundations of electronics and the physical operation of electronic devices. (This course is not open to Electrical Engineering Technology majors.) *Prereq. MTH 1193 or MTH 4120.*

EET 1321 Electricity and Electronics 2 (4 cl., 4 q.h.) (Day Curriculum)

Single-stage electronic circuits, magnetic circuits and transformers, electro mechanical energy conversion, d-c machines, a-c machines. (This course is not open to Electrical Engineering Technology majors.) *Prereq. EET 1320 or EET 4320.*

EET 1323 Electronics Laboratory (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semiconductor diodes; power supplies, including the regulated type; silicon controlled rectifiers; resistance-coupled amplifiers using transistors, including feedback methods. *Prereq. EET 1312 or EET 4312, or concurrently.*

EET 1327 Advanced Electronics Laboratory 1 (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. *Prereq. EET 1323 or EET 4323.*

EET 1328 Advanced Electronics Laboratory 2 (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. *Prereq. EET 1327 or EET 4327.*

EET 1329 Advanced Electronics Laboratory 3 (3 lab., 2 q.h.) (Day Curriculum)

Spectral studies of FM and PM waves, amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments and a series of digital experiments. *Prereq. EET 1328 or EET 4328.*

EET 1330 Energy Conversion (4 cl., 4 q.h.) (Day Curriculum)
Generalized theory of rotating energy conversion devices; steady-state operation of the multiply-excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines.
Prereq. EET 1353 or EET 4353

EET 1337 Distributed Systems (4 cl., 4 q.h.) (Day Curriculum)
Radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line. *Prereq.* MTH 1195 or MTH 4122.

EET 1353 Circuits Analysis 3 (4 cl., 4 q.h.) (Day Curriculum)
Application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time domain transient analysis; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts.
Prereq. EET 1152 or EET 4152.

EET 1354 Circuits Analysis 4 (4 cl., 4 q.h.) (Day Curriculum)
Signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods; a varied selection of circuit problems is solved using Laplace transforms and related theorems. *Prereq.* EET 1353 or EET 4353.

EET 1360 Engineering Analysis 1 (4 cl., 4 q.h.) (Day Curriculum)
Linear algebra and its application to circuit equations; solution of linear differential equations, including an introduction to Laplace transforms. *Prereq.* MTH 1195 or MTH 4122 and EET 1152 or EET 4152.

EET 1362 Basic Power Systems 1 (4 cl., 4 q.h.) (Day Curriculum)
Consideration of power transmission lines; line constants; current voltage and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq.* EET 1354 or EET 4354, GET 1100 or GET 4100.

EET 1363 Basic Power Systems 2 (4 cl., 4 q.h.) (Day Curriculum)
Consideration of symmetrical and unsymmetrical faults; protective devices – application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application. *Prereq.* EET 1362 or EET 4362.

EET 1364 Basic Power Systems 3 (4 cl., 4 q.h.) (Day Curriculum)
Computer applications to power systems with emphasis on load-flow studies; basic ideas of systems planning, short-circuit studies and system stability.
Prereq. EET 1363 or EET 4363.

EET 1370 Digital Computers 1 (4 cl., 4 q.h.) (Day Curriculum)
Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean algebra applications to computer design. *Prereq.* EET 1314 or EET 4314.

EET 1371 Digital Computers 2 (4 cl., 4 q.h.) (Day Curriculum)
Examination of microprocessor architecture and organization. Study of the machine language and assembly coding of an industry-accepted microprocessor. A suitable topic selected from the current literature by the instructor will be analyzed. Assembly language coding problems will be assigned. *Prereq.* EET 1370 or EET 4370.

EET 1377 Control Engineering 1 (4 cl., 4 q.h.) (Day Curriculum)

Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function. *Prereq.* EET 1354 or EET 4354 and MTH 1195 or MTH 4122.

EET 1378 Control Engineering 2 (4 cl., 4 q.h.) (Day Curriculum)

System stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq.* EET 1377 or EET 4377.

EET 1390 Optical Instrumentation (4 cl., 4 q.h.) (Day Curriculum)

Telescopes, microscopes, etc., as optical system components. Includes magnification, aberrations, resolution criteria, photometry. Compatibility of system components and optimization of systems. The basic nonimage-forming systems used for analysis control and metrology. *Prereq.* MTH 1192 or MTH 4108 and PHY 1193 or PHY 4119.

EET 1399 Special Problems in Electrical Engineering Technology (4 q.h.) (Day Curriculum)

Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

EET 4124 Circuits Laboratory 1 (3 lab., 2 q.h.)

Experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications. *Prereq.* EET 1151 or EET 4151.

EET 4125 Circuits Laboratory 2 (3 lab., 2 q.h.)

Further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, nonlinear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis. Fourier analysis and synthesis. *Prereq.* EET 1124 or EET 4124.

EET 4151 Circuits Analysis 1 (4 cl., 4 q.h.)

Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations – all with respect to direct currents; energy storage, singularity functions, responses of R, L, and C elements to singularities. *Prereq.* MTH 1193 or MTH 4120, PHY 1193 or PHY 4119.

EET 4152 Circuits Analysis 2 (4 cl., 4 q.h.)

Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq.* EET 1151 or EET 4151.

EET 4180 Introduction to Telecommunications (4 cl., 4 q.h.)

Survey course covering voice, video, and data communications. Lectures will cover theory and applications of the band frequencies and descriptions of the hardware required. Course will include laboratory exercises to reinforce lecture material. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* None.

EET 4310 Electrical Measurements (4 cl., 4 q.h.)

Standards of measurements, dimensional analysis, errors and measurements of dispersed data, discrete and continuous variables, binomial distribution, normal distribution, guaranteed error, methods of resistance measurements, digital voltmeters and analog to digital conversion, voltage references, potentiometers and a.c. bridges. *Prereq.* EET 1353 or EET 4353.

EET 4311 Electronics 1 (4 cl., 4 q.h.)

Semiconductor diodes and applications, transistor biasing techniques, graphical analysis of basic amplifiers, d.c. and a.c. load lines. *Prereq.* EET 1352 or EET 4352.

EET 4312 Electronics 2 (4 cl., 4 q.h.)

Small-signal, low-frequency transistor models, gains and impedances at mid-band, frequency effects in transistor circuits, multistage circuits, transistors used as current sources. *Prereq.* EET 1311 or EET 4311.

EET 4313 Electronics 3 (4 cl., 4 q.h.)

Review of Bode plots, transistor circuits at low and high frequencies, feedback, operational amplifiers, differential amplifiers, applications. *Prereq.* EET 1312 or EET 4312.

EET 4314 Pulse & Digital 1 (4 cl., 4 q.h.)

Switching characteristics of semiconductor devices; logic gates and the logic families ECL, MOS, Schottky TTL; speed limitations; concepts of waveshaping and wave generating circuits including comparators, Schmitt trigger, and relaxation oscillators. *Prereq.* EET 4311 or EET 1311.

EET 4315 Pulse & Digital 2 (4 cl., 4 q.h.)

Topics include digital operations; logic statements and theorems; minimization of logic functions; flip flops, counters, registers, and static and dynamic memory; introduction to sequential circuit design; sample and hold circuits; A-D and D-A conversion. *Prereq.* EET 4314 or EET 1314.

EET 4317 Principles of Communication Systems 1 (4 cl., 4 q.h.)

Signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers, including wideband; transistor power amplifiers AF and RF; oscillators; signal sources, and applications. *Prereq.* EET 1313 or EET 4313.

EET 4318 Principles of Communication Systems 2 (4 cl., 4 q.h.)

Basic theory of amplitude, frequency, phase and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; modems. *Prereq.* EET 1317 or EET 4317.

EET 4319 Principles of Communication Systems 3 (4 cl., 4 q.h.)

Fundamentals of digital communications; sampling requirements; analog to digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, PWM; time and frequency division multiplexing; data decoding; selected examples from telemetry and computer links. *Prereq.* EET 1318 or EET 4318.

EET 4320 Electricity and Electronics 1 (4 cl., 4 q.h.)

Introduction to circuit analysis, resistive networks, periodic excitation function, steady state a-c circuits; the physical foundations of electronics and the physical operation of electronic devices. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* MTH 1193 or MTH 4120 and PHY 1193 or PHY 4119.

EET 4321 Electricity and Electronics 2 (4 cl., 4 q.h.)

Single-stage electronic circuits, magnetic circuits and transformers, electro-mechanical energy conversion, d-c machines, a-c machines. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* EET 1320 or EET 4320.

EET 4323 Electronics Laboratory (3 lab., 2 q.h.)

Experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semiconductor diodes; power supplies, including the regulated type; silicon controlled rectifiers; resistance-coupled amplifiers using transistors, including feedback methods. *Prereq.* EET 1312 or EET 4312.

EET 4327 Advanced Electronics Laboratory 1 (3 lab., 2 q.h.)

Experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. *Prereq.* EET 1323 or EET 4323.

EET 4328 Advanced Electronics Laboratory 2 (3 lab., 2 q.h.)

Experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. *Prereq.* EET 1327 or EET 4327.

EET 4329 Advanced Electronics Laboratory 3 (3 lab., 2 q.h.)

Spectral studies of FM and PM waves, amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments and a series of digital experiments. *Prereq.* EET 1328 or EET 4328.

EET 4330 Energy Conversion (4 cl., 4 q.h.)

Generalized theory of rotating energy conversion devices; steady-state operation of the multiply-excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* EET 1353 or EET 4353.

EET 4337 Distributed Systems (4 cl., 4 q.h.)

Radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line. *Prereq.* MTH 1195 or MTH 4122 and PHY 1193 or PHY 4119.

EET 4341 Power and Controls Laboratory 1 (2½ lab., 2 q.h.)

These experiments introduce the student to standard laboratory measurement equipment, including voltmeter, ammeters, oscilloscopes, and frequency counters, as well as data-taking methods and report writing. Devices investigated include diodes, bipolar transistors, field effect devices, silicon control rectifiers, unijunction transistors, power supplies, regulators, and various types of feedback transistor amplifiers. *Prereq.* EET 1330 or EET 4330.

EET 4342 Power and Controls Laboratory 2 (2½ lab., 2 q.h.)

Experiments with characteristics of DC motors and generators, single- and multi-phase transformers, induction motors, synchronous motors, and 3-phase power measurements. *Prereq.* EET 4341.

EET 4343 Power and Controls Laboratory 3 (2½ lab., 2 q.h.)

Experiments with self-synchronous devices such as control transformers, transmitters and receivers, AC and DC servomotors, open and closed loop response of servo mechanisms and stepping motors. *Prereq.* EET 4342.

EET 4349 Advanced Electronics Laboratory 4 (2½ lab., 2 q.h.)

Electronic engineering exercises selected from the following topics: transistor amplifier design, operational amplifiers, analog computation, Fourier optics, acoustics, and microwaves. *Prereq.* EET 1329 or EET 4329.

EET 4350 Advanced Electronics Laboratory 5 (2½ lab., 2 q.h.)

Design projects laboratory. Students will be directed in design of such projects as motor speed control, DC-DC converter, high current pulse amplifiers, etc. *Prereq.* EET 4349.

EET 4353 Circuits Analysis 3 (4 cl., 4 q.h.)

Application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time domain transient analysis; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts. *Prereq.* EET 1152 or EET 4152.

EET 4354 Circuits Analysis 4 (4 cl., 4 q.h.)

Signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods; a varied selection of circuit problems is solved using Laplace transforms and related theorems. *Prereq.* EET 1353 or EET 4353.

EET 4362 Basic Power Systems 1 (4 cl., 4 q.h.)

Consideration of power transmission lines; line constants; current voltage and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq.* EET 1354 or EET 4354.

EET 4363 Basic Power Systems 2 (4 cl., 4 q.h.)

Consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application. *Prereq.* EET 1362 or EET 4362.

EET 4364 Basic Power Systems 3 (4 cl., 4 q.h.)

Computer applications to power systems with emphasis on load-flow studies; basic ideas of systems planning, short-circuit studies and system stability. *Prereq.* EET 1363 or EET 4363.

EET 4370 Digital Computers (4 cl., 4 q.h.)

Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units. Boolean Algebra applications to computer design. *Prereq.* EET 4314 or EET 1314.

EET 4371 Digital Computers 2 (4 cl., 4 q.h.)

Examination of microprocessor architecture and organization. Study of the machine language and assembly coding of an industry-accepted microprocessor. A suitable topic selected from the current literature by the instructor will be analyzed. Assembly language coding problems will be assigned. *Prereq.* EET 1370 or EET 4370.

EET 4377 Control Engineering 1 (4 cl., 4 q.h.)

Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function. *Prereq.* EET 1354 or EET 4354, MTH 1195 or MTH 4122.

EET 4378 Control Engineering 2 (4 cl., 4 q.h.)

System stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq.* EET 1377 or EET 4377.

EET 4381 Telecommunications Systems 1 (4 cl., 4 q.h.)

PBX and telephone exchanges; switching and signalling systems, main frames, trunking; grounding and shielding; central office control; local area networks; transmission lines such as wire, cable, waveguide, fiber optics; integrated information systems processing and storage of signal. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* EET 4180 or EET 4152.

EET 4382 Telecommunications Systems 2 (4 cl., 4 q.h.)

R.F. transmission systems; wave propagation in the troposphere and ionosphere; microwave and satellite transmission and reception; mobile telephone systems; broadcast station components, control (local and remote), proof of performance, logs. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* EET 4381.

EET 4383 Telecommunications Systems 3 (4 cl., 4 q.h.)

Telecommunication standards: Voice, video, and data; system installation, maintenance, and calibration; information and bandwidth; noise properties; error rates and performance factors; error detection and correction; F.C.C. requirements. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* EET 4382.

EET 4384 Video Communications (4 cl., 4 q.h.)

The television signal, synchronization, balancing and interleaving, cameras, transmitters and receivers, video cassette recorders, video discs, and cable networks. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* PHY 4119, EET 4180, EET 4151.

EET 4391 Basic Optics and Optical Systems Design (4 cl., 4 q.h.)

Develops the basics of optical imaging in the Gaussian approximation. Analyzes the various design considerations stemming from lens aberration, intent and forms of optical systems and flux throughput. The essentials of a wave description of light are also presented along with instrumental designs for exhibiting interference and diffraction. No previous background in optics is assumed. *Prereq.* MTH 1192 or MTH 4108, PHY 1193 or PHY 4119.

EET 4392 Optoelectronics and Fiber Optics (4 cl., 4 q.h.)

Presents an overview of the various elements and their characteristics utilized in optical communication systems. They entail those elements which generate light (lasers, diodes); modulate light (as in scanning or information encoding); transfer light (optical fibers); detect light; display and store light or its encoded information. *Prereq.* EET 4391.

EET 4399 Special Problems in Electrical Engineering Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

General Engineering Technology

GET 1100 Computer Programming for Engineering Technology (4 cl., 4 q.h.) (Day Curriculum)

Introduction to the use of computers for problem solving using FORTRAN 77. Topics: Flowcharts, DO loops, arrays, subroutines, functions, and character manipulations. The student will use the university's computer facilities to run program assignments. *Prereq.* MTH 1192 or MTH 4108.

GET 1170 Engineering Graphics 1 (4 cl., 4 q.h.) (Day Curriculum)

Fundamentals of the graphic language. Understanding of graphical methods of presentation including 2-D data representation and 3-D solids depiction. Production and reading of 3-D drawings. Basic drawing skills used by technicians supplemented by an introduction to computer graphics. *Prereq.* None.

GET 1171 Engineering Graphics 2 (4 cl., 4 q.h.) (Day Curriculum)

Continuation of concepts in engineering graphics including dimensioning, developments, intersections, assemblies and including topographical drawing. The design process including solving an engineering design problem. Computer graphics hardware and software. Case studies in engineering design. *Prereq.* GET 1170 or equiv.

GET 1172 Electrical Engineering Graphics (4 cl., 4 q.h.) (Day Curriculum)

Introduction to electronic graphics, including symbols, schematics, block and logic diagrams, production and cable drawings, military standards. A study of single- and double-sided printed circuit layout, integrated circuits, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq.* GET 1170 or equiv.

GET 1301 FORTRAN for Engineering Computation (4 cl., 4 q.h.) (Day Curriculum)

Professional methods for solving engineering problems with FORTRAN. Students will write and run programs using the University's computer. Topics include: sub-programs, scientific software packages, solution of equations, data storage, reduction and display. *Prereq.* GET 1100 or GET 4100.

GET 1315 Pascal (A Second Language) (4 cl., 4 q.h.) (Day Curriculum)

An introductory course in programming computers using the Pascal language. Students will write and run programs using the University's computer facilities. This course may not be used as a technical elective in the Computer Technology Program. *Prereq.* GET 1100 or GET 4100.

GET 1364 Kinematics (4 cl., 4 q.h.) (Day Curriculum)

Study of four-bar linkages, sliders, etc., using orthogonal components of vectors, instantaneous centers, equivalent linkages, effective cranks, etc., emphasizing graphical solutions, including an introduction to the computer to enhance these concepts. Reverted and epicyclic gear trains are analyzed, as are cam displacement, velocity, and acceleration diagrams. *Prereq.* GET 1171 and PHY 1191 or equiv.

GET 4100 Computer Programming for Engineering Technology (4 cl., 4 q.h.)

Introduction to the use of computers for problem solving using FORTRAN 77. Topics: flowcharts, DO loops, arrays, subroutines, functions, and character manipulations. The student uses the University's computer facilities to run program assignments. *Prereq.* MTH 4108 or MTH 1192.

GET 4113 BASIC (4 cl., 4 q.h.)

Introduction to BASIC as another programming language. Students write and run programs on the Northeastern University Computer System using the READ and DATA Statements; Arithmetic operations in BASIC; the GO TO, IF. . . .THEN, FOR and NEXT, and the INPUT Statements. Also covered will be control of loops, special functions, lists and tables, defining functions and matrix operations. *Prereq. None.* (This course is not open to students who have taken CT 4313.)

GET 4138 Computer Programming for Telecommunications (4 cl., 4 q.h.)

An introduction to computers and their programming. The student will be introduced to the major components of the computer and how they function together. Programming topics include algorithms, programming philosophy, and flow charts. A high-level language will be taught to enable students to write programs and run them on Northeastern University's computer. *Prereq. None.*

GET 4144 Introduction to Personal Computer (4 cl., 4 q.h.)

The use, capabilities, and limitations of the DOS Operating System and popular application software packages such as LOTUS 1-2-3, D Base III, and RELAY. Students will be instructed in Basic Programming and will be required to write and run introductory programs for which N.U.'s computer facilities will be available. Costs and benefits of different personal computer configurations and expansion options will be discussed. *Prereq. None.* (This course is not open to students who have taken CT 4344.)

GET 4170 Engineering Graphics 1 (4 cl., 4 q.h.)

Introduction to engineering drawing by geometric constructions, charting, and graphs. Orthographic projection, including reading, sketching, and auxiliary views. Axonometric drawing and elements of descriptive geometry. Section and conventions. *Prereq. None.*

GET 4171 Engineering Graphics 2 (4 cl., 4 q.h.)

Determination of design project. Intersections and development. Manufacturing processes and dimensioning, including true position tolerancing. Threads and fasteners. Making and reading assembly drawing. Topographical and earth work drawings as applicable to civil engineers. Case studies of engineering problems and introduction to computer-aided design. Presentation of design project. *Prereq. GET 4170 or equiv.*

GET 4172 Electrical Engineering Graphics (4 cl., 4 q.h.)

Introduction to electronic graphics, including symbols, schematics, block and logic diagrams, production and cable drawings, military standards. A study of single- and double-sided printed circuit layout, integrated circuits, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq. GET 4170 or equiv.*

GET 4301 FORTRAN Engineering Computation (4 cl., 4 q.h.)

Professional methods for solving engineering problems with FORTRAN. Students will write and run programs using the University's computer facilities. Topics include: subprograms, scientific software packages, solution of equations, data storage, reduction and display. *Prereq. GET 4100 or GET 1100.*

GET 4306 Technical Communications 1 (3 q.h.)

Exercises in written and spoken presentations of a calibre expected of professionals. *Prereq. ENG 4111.*

GET 4307 Technical Communications 2 (3 q.h.)

Exercises in the organizing, researching, and writing techniques essential to engineering management. The course leads students through an intensive examination and utilization of professional technical writing techniques. *Prereq.* GET 4306.

GET 4315 Pascal (A Second Language) (4 cl., 4 q.h.)

An introductory course in programming computers using the Pascal language. Students write and run programs using the University's computer facilities. This course may not be used as a technical elective in the Computer Technology Program. *Prereq.* GET 4100 or equiv.

GET 4364 Kinematics (4 cl., 4 q.h.)

Study of four-bar linkages, sliders, etc., using orthogonal components of vectors, instantaneous centers, equivalent linkages, effective cranks, etc., emphasizing graphical solutions, including an introduction to the computer to enhance these concepts. Reverted and epicyclic gear trains are analyzed, as are cam displacement, velocity, and acceleration diagrams. *Prereq.* GET 4171 and PHY 4117 or equiv.

Industrial Engineering Technology

IIS 1356 Engineering Economy (4 cl., 4 q.h.) (Day Curriculum)

Topics include the formulation of analytical techniques, e.g., rate of return, present worth, and annual cost. The application of these techniques to solve business and engineering problems involving design, selection replacement, lease-buy decisions, and decisions between multiple alternatives. Sensitivity analysis and basic probability are introduced in cases where uncertainty exists. Brief survey of sources and costs of capital, debt-versus-equity financing, and leverage. *Prereq.* None.

IIS 4360 Engineering Economy (4 cl., 4 q.h.)

Fundamental accounting concepts and familiarization with terminology. Assets, liability, net worth. Analysis of income statement and balance sheet. Flow of funds in a firm. Sources of capital-equity, borrowed, retained earnings, depreciation and depreciation accounting, taxes. Cost of capital, time value of money, equivalence, cash flow of diagrams and tables. Development of cash flows for alternative capital expenditures, analytical methods of engineering economy, including present worth, annual cost, and rate of return. Incremental rate of return, breakeven analysis. Retirement and replacement. *Prereq.* None.

IIS 4393 Engineering Probability and Statistics (4 cl., 4 q.h.)

Algebra of events and sets. Probability measure, laws of probability. Independence, conditional probability. Random variables, discrete and continuous. Properties of random variables, including density functions, expectations, variance. Sampling statistics. Estimation of parameters of random variables. Point and interval estimation. Hypothesis testing. Simple and composite hypothesis. One-sided and two-sided tests. Tests of measures of variances. Normal, standard deviation, F, X. *Prereq.* MTH 4123 or MTH 1196.

Mechanical Engineering Technology

MET 1301 Mechanics A (4 cl., 4 q.h.) (Day Curriculum)

Forces, moments, couples, statics of particles and rigid bodies in two and three dimensions; distributed forces—external and internal; first moments and centroids; analysis of structure—trusses, frames, and machines. *Prereq.* MTH 1193 or MTH 4120, PHY 1191 or PHY 4117.

MET 1302 Mechanics B (4 cl., 4 q.h.) (Day Curriculum)

Friction, second moments, and virtual work; kinematics of particles—rectilinear and curvilinear motion of dynamic particles—force, mass and acceleration, work and energy. *Prereq.* MET 1301 or MET 4301.

MET 1303 Mechanics C (4 cl., 4 q.h.) (Day Curriculum)

Impulse and momentum of particles; kinematics and dynamics of rigid bodies—force, mass, and acceleration; dynamics of rigid bodies—work and energy, impulse and momentum; introduction to mechanical vibration. *Prereq.* MET 1302 or MET 4302.

MET 1314 Stress Analysis A (4 cl., 4 q.h.) (Day Curriculum)

Axially loaded members; stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members; thin-walled pressure vessels; centric loading of bolted and welded connection. Shear and moment in beams; eccentrically loaded connections; flexural and transverse shearing stresses in beams. *Prereq.* MET 1301 or MET 4301.

MET 1315 Stress Analysis B (4 cl., 4 q.h.) (Day Curriculum)

Determinate and indeterminate beam deflections and reactions by integration and area moment methods. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses; principal stresses; Mohr's circle; theories of failure. *Prereq.* MET 1314 or MET 4314.

MET 1319 Mechanics (4 cl., 4 q.h.) (Day Curriculum)

A mechanics course for nonmechanical students. *Prereq.* MTH 1193 or MTH 4120, PHY 1191 or PHY 4117.

MET 1330 Mechanical Design A (4 cl., 4 q.h.) (Day Curriculum)

Introduction to mechanical design, the design process, design factors, creativity, optimization, human factors, value engineering. These principles discussed and developed in an introductory manner through simple design projects. Principles of design, properties, and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. *Prereq.* MET 1315 or MET 4315, MET 1380 or MET 4380.

MET 1331 Mechanical Design B (4 cl., 4 q.h.) (Day Curriculum)

Stresses; deformation and design of fasteners, screws, joints, springs, and bearings; lubrication and journal bearings. Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes. *Prereq.* MET 1330 or MET 4330.

MET 1340 Thermodynamics A (4 cl., 4 q.h.) (Day Curriculum)

General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles. *Prereq.* PHY 1192 or PHY 4118, and CHEM 1131 or CHM 4111.

MET 1341 Thermodynamics B (4 cl., 4 q.h.) (Day Curriculum)

Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance. Fan performance. *Prereq.* MET 1340 or MET 4340.

MET 1342 Refrigeration & Air Conditioning (4 cl., 4 q.h.) (Day Curriculum)

Air-conditioning principles, including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. Principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems. *Prereq.* MET 1341 or MET 4341.

MET 1343 Heat Transfer (4 cl., 4 q.h.) (Day Curriculum)

The primary modes of heat transfer; thermal conductivity; thermal conductance/resistance concept; thermal-electrical analogy; combined heat transfer mechanisms, basic equations of conduction; analytical solution of various steady state conduction problems. Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; black body radiation; Kirchhoff's law; emissivity and absorptivity; radiation between simple bodies; numerical methods. Log mean temperature differences; overall heat transfer coefficients; heat exchanger effectiveness; tubular exchanger design; regenerative and evaporative heat exchangers; heat transfer engineering problems. *Prereq.* MET 1341 or MET 4341.

MET 1370 Fluid Mechanics A (4 cl., 4 q.h.) (Day Curriculum)

Hydrostatics, principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. *Prereq.* MET 1302 or MET 4302.

MET 1371 Fluid Mechanics B (4 cl., 4 q.h.) (Day Curriculum)

Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow, nonuniform flow; accelerated and retarded flow; hydraulic jump and waves. *Prereq.* MET 1370 and MET 4370.

MET 1380 Materials A (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: fundamental metallic structures; general metallurgical information covering theoretical aspects of properties; testing and failure of metals; supplemented by visual aids. Lectures on: alloying and hardening of metals; refinement of metals; equilibrium diagrams; characteristics of engineering metals; principles of metal fabrication. *Prereq.* None.

MET 1390 Measurement & Analysis Laboratory (3 lab., 2 q.h.) (Day Curriculum)

Experimental procedures for the collection and analysis of data by graphical and numerical methods, including computer applications, report writing that draws conclusions which are relative to accuracy, precision, true values, and measured values as they are related to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements. *Prereq.* MET 1314 or MET 4314, GET 1100 or GET 4100, MTH 1195 or MTH 4122, PHY 1193 or PHY 4119.

MET 1391 Technology Laboratory A (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by environmental conditions that are normal and abnormal; also as they are affected by homogeneity, nonhomogeneity, isotropy, and nonisotropy. *Prereq.* MET 1390 or MET 4390, MET 1315 or MET 4315, MET 1380 or MET 4380, or concurrently.

MET 1392 Technology Laboratory B (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures to determine the physical properties of incompressible fluids, measure the flow rates and velocities utilizing pitot tubes, orifice plates, venturii meter, and weirs flow meters, U-tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits under pressure, pipe networks, turbines, and pumps. *Prereq.* MET 1390 or MET 4390, MET 1370 or MET 4370, or concurrently.

MET 1393 Technology Laboratory C (3 lab., 2 q.h.) (Day Curriculum)
Basic thermodynamic relationships; experimental procedures to examine the flow of compressible fluids and steam; examine the energy conversion of a fuel into a working substance and the related heat transfer mechanisms. Operating characteristics of thermal generators, engines, and compressors. *Prereq.* MET 1390 or MET 4390, MET 1341 or MET 4341, or concurrently.

MET 1394 Technology Laboratory D (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, friction horsepower, mean effective pressure, fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems; energy conversion of fuels. *Prereq.* MET 1393 or MET 4393, MET 1341 or MET 4341, MET 1343 or MET 4343, or concurrently.

MET 1395 Technology Laboratory E (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures of a project nature to examine refrigeration, air conditioning, and heating pump cycles. A project of analytical, design, or experimental nature. Experiments of advanced or specialized nature. *Prereq.* MET 1390 or MET 4390, MET 1342 or MET 4342, MET 1343 or MET 4343.

MET 1396 Machine Shop (2 cl., 3 lab., 4 q.h.) (Day Curriculum)
Introduction to study of machines for metal processing, cutting tools, and fluids; machinability; automatic machinery. *Prereq.* None.

MET 1414 Mechanical Vibrations (4 cl., 4 q.h.) (Day Curriculum)
Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility; systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq.* MET 1303 or MET 1403.

MET 1415 Experimental Stress Analysis (4 cl., 4 q.h.) (Day Curriculum)
Theory and experimentation showing the application of extensometers and electrical strain gauges and as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq.* MET 1315 or MET 4315.

MET 1416 Stress Analysis C (4 cl., 4 q.h.) (Day Curriculum)

Curved beams, nonsymmetrical bending of beams; shear-center and shear stresses on thin sections; composite beams. Columns; energy absorption and resilience; inertial stresses, impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq.* MET 1315 or MET 4315.

MET 1444 Power Generation (4 cl., 4 q.h.) (Day Curriculum)

Basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, etc., on cycle performance; Rankine regenerative cycles; effects of steam temperature, pressure, number of feedwater heaters, etc., upon performance; steam generation equipment; boilers, reactors. Fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations; axial and centrifugal fan performance characteristics; pump design and performance considerations; heat exchanger design considerations. Applications of principles of economics to cycle and performance considerations; use of load curves; economic considerations of heat rate; economics of equipment selection; study of auxiliary equipment such as precipitators and flue gas desulfurization systems. *Prereq.* MET 1341 or MET 4341.

MET 1481 Materials B (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: inorganic materials, i.e., polymers, glasses, ceramics, cements, wood, and materials having important electrical and magnetic properties; also a summary of the most up-to-date applications for the fabrication and uses of both metals and nonmetals. Structures of metals; imperfections; phase diagrams; effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of nonferrous metals. Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of nonferrous metals; use of the microscope; linear analysis; construction of cooling curves; and simple binary phase diagrams. *Prereq.* MET 1380 or MET 4380.

MET 1482 Applied Metallurgy (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: mechanical properties of ferrous metals, the iron carbon diagram, high-temperature alloys, hardening methods, impact tests, effects of environment on metals; manufacturing processes; methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy. Laboratory: experiments of analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swaging, drawing of nonferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq.* MET 1481 or MET 4481.

MET 1499 Special Problems in Mechanical Engineering Technology (4 q.h.) (Day Curriculum)

Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

MET 4301 Mechanics A (4 cl., 4 q.h.)

Forces; moments, couples, statics of particles and rigid bodies in two and three dimensions; distributed forces—external and internal; first moments and centroids; analysis of structure-trusses, frames, and machines. *Prereq.* MTH 1193 or MTH 4120, PHY 1191 or PHY 4117.

MET 4302 Mechanics B (4 cl., 4 q.h.)

Friction, second moments, and virtual work; kinematics of particles-rectilinear and curvilinear motion of dynamic particles—force, mass and acceleration, work and energy. *Prereq.* MET 1301 or MET 4301.

MET 4303 Mechanics C (4 cl., 4 q.h.)

Impulse and momentum of particles; kinematics and dynamics of rigid bodies/force/mass and acceleration; dynamics of rigid bodies—work and energy. Impulse and momentum; introduction to mechanical vibration. *Prereq.* MET 1302 or MET 4302.

MET 4314 Stress Analysis (4 cl., 4 q.h.)

Axially loaded members; stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members; thin-walled pressure vessels; centric loading of bolted and welded connection. Shear and moment beams; eccentrically loaded connections; flexural and transverse shearing stresses in beams. *Prereq.* MET 1301 or MET 4301.

MET 4315 Stress Analysis B (4 cl., 4 q.h.)

Determinate and indeterminate beam deflections and reactions by integration and area moment methods. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses; principal stresses; Mohr's circle theories of failure. *Prereq.* MET 1314 or MET 4314.

MET 4319 Mechanics (4 cl., 4 q.h.)

A mechanics course for nonmechanical students. *Prereq.* MTH 1193 or MTH 4120, PHY 1191 or PHY 4117.

MET 4330 Mechanical Design A (4 cl., 4 q.h.)

Introduction to mechanical design, the design process, design factors, creativity, optimization, human factors, value engineering. These principles discussed and developed in an introductory manner through simple design projects. Principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. *Prereq.* MET 1314 or MET 4314, MET 1380 or MET 4380.

MET 4331 Mechanical Design B (4 cl., 4 q.h.)

Stresses; deformation and design of fasteners, screws, joints, springs, and bearings, lubrication and journal bearings. Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes. *Prereq.* MET 1330 or MET 4330.

MET 4340 Thermodynamics A (4 cl., 4 q.h.)

General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. Thermodynamics properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles. *Prereq.* PHY 1192 or PHY 4118 and CHM 4111 or CHM 1131.

MET 4341 Thermodynamics B (4 cl., 4 q.h.)

Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance. Fan performance. *Prereq.* MET 1340 or MET 4340.

MET 4342 Refrigeration & Air Conditioning (4 cl., 4 q.h.)

Air conditioning principles, including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. Principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems. *Prereq.* MET 1341 or MET 4341.

MET 4343 Heat Transfer (4 cl., 4 q.h.)

The primary modes of heat transfer; thermal conductivity; thermal conductance/resistance concept; thermal-electrical analogy; combined heat transfer mechanisms, basic equations of conduction; analytical solutions of various steady state conduction problems. Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; black body radiation; Kirchhoff's law; emissivity and absorptivity; radiation between simple bodies; numerical methods. Log mean temperature differences; overall heat transfer coefficients; heat exchanger effectiveness; tubular exchanger design; regenerative and evaporative heat exchangers; heat transfer engineering problems. *Prereq.* MET 1341 or MET 4341.

MET 4344 Energy Systems Theory & Hydronics (4 cl., 4 q.h.)

The elementary principles of heat transfer along with the heat loss calculations of buildings and basic HVAC fundamentals along with architectural technology and building materials are discussed. The election of heat transmission coefficients, instrumentation, heat transfer coefficients, heating load, combustion and venting are covered. Instruction includes the study of basic hydraulics and hot water heating, fluid flow, pumps, boilers, and forced circulation. *Prereq.* MTH 4108 and GET 4170.

MET 4370 Fluid Mechanics A (4 cl., 4 q.h.)

Hydrostatics, principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. *Prereq.* MET 1302 or MET 4302.

MET 4371 Fluid Mechanics B (4 cl., 4 q.h.)

Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; nonuniform flow; accelerated and retarded flow; hydraulic jump and waves. *Prereq.* MET 1370 or MET 4370.

MET 4380 Materials A (4 cl., 4 q.h.)

Lectures on: fundamental metallic structures; general metallurgical information covering theoretical aspects of properties; testing and failure of metals; supplemented by visual aids. Lectures on: alloying and hardening of metals; refinement of metals; equilibrium diagrams; characteristics of engineering metals; principles of metal fabrication. *Prereq.* None.

MET 4390 Measurement & Analysis Laboratory (3 lab., 2 q.h.)

Experimental procedures for the collection and analysis of data by graphical and numerical methods, including computer applications, report writing that draws conclusions which are relative to accuracy, precision, true values, and measured values as they are related to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements. *Prereq.* MET 1314 or MET 4314, GET 1100 or GET 4100, MTH 1195 or MTH 4122, PHY 1193 or PHY 4119.

MET 4391 Technology Laboratory A (3 lab., 2 q.h.)

Experimental procedures to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by environmental conditions that are normal and abnormal; also as they are affected by homogeneity, nonhomogeneity, isotropy, and nonisotropy. *Prereq.* MET 1390 or MET 4390, MET 1315 or MET 4315, MET 1380 or MET 4380, or concurrently.

MET 4392 Technology Laboratory B (3 lab., 2 q.h.)

Experimental procedures to determine the physical properties of incompressible fluids, measure the flow rates and velocities utilizing pitot tubes, orifice plates, venturii meter, and weirs flow meters, U-tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits under pressure, pipe networks, turbines, and pumps. *Prereq.* MET 1390 or MET 4390, MET 1370 or MET 4370, or concurrently.

MET 4393 Technology Laboratory C (3 lab., 2 q.h.)

Basic thermodynamic relationships; experimental procedures to examine the flow of compressible fluids and steam and to examine the energy conversion of a fuel into a working substance and the related heat transfer mechanisms. Operating characteristics of thermal generators, engines, and compressors. *Prereq.* MET 1390 or MET 4390, MET 1341 or MET 4341, or concurrently.

MET 4394 Technology Laboratory D (3 lab., 2 q.h.)

Experimental procedures to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, mean effective pressure, fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems; energy conversion of fuels. *Prereq.* MET 1393 or MET 4393, MET 1341 or MET 4341, MET 1343 or MET 4343, or concurrently.

MET 4395 Technology Laboratory E (3 lab., 2 q.h.)

Experimental procedures of a project nature to examine refrigeration, air conditioning, and heating pump cycles. A project of analytical, design, or experimental nature. Experiments of advanced or specialized nature. *Prereq.* MET 1390 or MET 4390, MET 1342 or MET 4342, MET 1343 or MET 4343.

MET 4414 Mechanical Vibrations (4 cl., 4 q.h.)

Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility; systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq.* MET 1303 or MET 4303.

MET 4415 Experimental Stress Analysis (4 cl., 4 q.h.)

Theory and experimentation showing the application of extensometers and electrical strain gauges and as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq.* MET 1315 or MET 4315.

MET 4416 Stress Analysis C (4 cl., 4 q.h.)

Curved beams; nonsymmetrical bending of beams; shear-center and shear stresses on thin sections; composite beams. Columns; energy absorption and resilience; inertial stresses, impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq.* MET 1315 or MET 4315.

MET 4444 Power Generation (4 cl., 4 q.h.)

Basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, etc., on cycle performance; Rankine regenerative cycles; effects of steam temperature, pressure, number of feedwater heaters, etc., upon performance, steam generation equipment; boilers, reactors. Fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations; axial and centrifugal fan performance characteristics; pump design and performance considerations; heat exchanger design considerations. Applications of principles of economics to cycle and performance considerations; use of load curves; economic considerations of heat rate; economics of equipment selection; study of auxiliary equipment such as precipitators and flue gas desulfurization systems. *Prereq.* MET 1341 or MET 4341, MET 4395

MET 4481 Materials B (4 cl., 4 q.h.)

Lectures on: inorganic materials, i.e., polymers, glasses, ceramics, cements, wood, and materials having important electrical and magnetic properties; also a summary of the most up-to-date applications for the fabrication and uses of both metals and nonmetals. Structures of metals; imperfections; phase diagrams; effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of nonferrous metals. Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of nonferrous metals; use of the microscope; linear analysis; construction of cooling curves; and simple binary phase diagrams. *Prereq.* MET 1380 or MET 4380.

MET 4482 Applied Metallurgy (4 cl., 4 q.h.)

Lectures on: mechanical properties of ferrous metals, the iron carbon diagram, high-temperature alloys, hardening methods, impact tests, effects of environment on metals; manufacturing processes; methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy. Laboratory: experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swaging, drawing of nonferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq.* MET 1481 or MET 4481.

Mathematics

MTH 1191 College Algebra (4 cl., 4 q.h.) (Day Curriculum)

Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variation; roots and polynomial equations. *Prereq.* Mathematics placement test or MTH 4082.

MTH 1192 Pre-Calculus (4 cl., 4 q.h.) (Day Curriculum)

Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq.* MTH 1191 or MTH 4107.

MTH 1193 Calculus 1 (4 cl., 4 q.h.) (Day Curriculum)

Plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivations of higher order; curve sketching; basics in functions; limits, and continuity. *Prereq.* MTH 1192 or MTH 4108.

MTH 1194 Calculus 2 (4 cl., 4 q.h.) (Day Curriculum)

Applications of derivatives to curvesketching; antidifferentiation; the definite integral, with applications; calculus of nonalgebraic functions – logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; L'Hospital's rule. *Prereq.* MTH 1193 or MTH 4120, either CT 1105 or CT 4105 or GET 1100 or GET 4100.

MTH 1195 Calculus 3 (4 cl., 4 q.h.) (Day Curriculum)

Calculus of functions of several variables; partial differentiation; multiple integrals; infinite series; vector analysis; polar coordinates; vectors in a plane. *Prereq.* MTH 1194 or MTH 4121.

MTH 4081 Introduction to Mathematics 1 (4 cl., 4 q.h.)

A comprehensive review of high school algebra, including first-degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. (This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.) *Prereq.* None.

MTH 4082 Introduction to Mathematics 2 (4 cl., 4 q.h.)

Algebraic operations with complex fractions, mixed expressions, square roots, radicals, quadratic equations; simultaneous equations, graphs and fractional zero and negative exponents; the geometry of the right triangle, areas of polygons, circles, and loci problems. (This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.) *Prereq.* MTH 4081.

MTH 4083 Applied Mathematics & Statistics (3 q.h.)

The use of mathematics as a guide to concise thinking; the application of mathematical methods to highlight significant data. The use of elementary analytical models to test and evaluate hypotheses. An examination of the role of chance in physical phenomena. The importance of the use of a relevant statistical model. Methods for the selection of a data base. *Prereq.* MTH 4082 or equiv.

MTH 4107 College Algebra (4 cl., 4 q.h.)

Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variation; roots of polynomial equations. *Prereq.* Mathematics placement test or MTH 4082.

MTH 4108 Pre-Calculus (4 cl., 4 q.h.)

Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq.* MTH 4107 or MTH 1192.

MTH 4120 Calculus 1 (4 cl., 4 q.h.)

The plane analytical geometry through conics needed in differential calculus; together with the theory and evaluation of limits; the derivative of algebraic and trigonometric functions; applications of differentiation including velocity, acceleration, related rates, maximum, minimum, and curve sketching; finishing with polar coordinates and the graphs of polar equations. *Prereq.* MTH 4108 or MTH 1192.

MTH 4121 Calculus 2 (4 cl., 4 q.h.)

The antiderivative and a development of the fundamental theorem with applications to areas, volumes, and rectilinear motion problems. The logarithmic exponential and inverse trigonometric functions and their applications are covered along with techniques of integration including parts, partial fractions, substitution, and the use of tables. Numerical integration (Simpson's & Trapezoidal Rule), L'Hospital's Rule, and improper integrals as well as the geometry of vectors in a plane and space are also included. *Prereq.* MTH 4120 or MTH 1193.

MTH 4122 Calculus 3 (4 cl., 4 q.h.)

The study of 3-dimensional space followed by a treatment of functions of several variables; multiple integrals with applications in areas and volumes. An extensive treatment of sequences and series followed by an introduction to the study of differential equations which includes the solution with applications of first-order with variables separable, first-order linear, and second-order linear homogeneous to complete the sequence. *Prereq.* MTH 4121 or MTH 1194.

MTH 4123 Differential Equations (4 cl., 4 q.h.)

Linear differential equations with constant coefficients, homogeneous and nonhomogeneous; variation of parameters, simultaneous differential equations; Laplace transform; series and solution of differential equations by series; Fourier series; orthogonal functions. *Prereq.* MTH 4122 or MTH 1195.

Physics

*Courses marked * not available in every curriculum. See curricula and Academic Programs of Instruction section for applicable sequence.*

PHY 1191 Physics 1 (Mechanics) (4 cl., 4 q.h.) (Day Curriculum)

Units and scientific notation; force; Newton's first law; static equilibrium; Newton's second law; momentum; work; kinetic energy; potential energy. *Prereq.* MTH 1191 or concurrently.

PHY 1192 Physics 2 (Properties of Matter, Heat, Wave Motion, Sound, Light) (4 cl., 4 q.h.) (Day Curriculum)

Power; rotational motion; Pascal's law; hydrostatic pressure; molecular mass; ideal gas law; first and second laws of thermodynamics; simple harmonic motion; wave motion; sound; light. *Prereq.* PHY 1191.

PHY 1193 Physics 3 (Electricity, Magnetism) (4 cl., 4 q.h.) (Day Curriculum)

Electrostatics; circuit elements; direct current circuits; magnetism; electromagnetic induction; electromagnetic waves; atomic and nuclear physics. *Prereq.* PHY 1192.

PHY 1194 Physics Laboratory 1 (2.3 lab., 2 q.h.) (Day Curriculum)

First quarter of a two-quarter physics laboratory. Experiments in mechanics, fluid dynamics, and gas laws. *Prereq.* PHY 1192.

PHY 1195 Physics Laboratory 2 (2.3 lab., 2 q.h.) (Day Curriculum)

A continuation of PHY 1194. Experiments in wave motion, optics, electrical circuits and nuclear and atomic physics. *Prereq.* PHY 1194.

***PHY 4104 General Physics 1** (2 cl., 2 q.h.)

Survey of Newtonian mechanics, kinematics, and dynamics of particle motion; projectile and circular motion; conservation laws of energy and momentum. *Prereq.* MTH 4110 or concurrently.

***PHY 4105 General Physics 2** (2 cl., 2 q.h.)

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; elasticity and simple harmonic motion; rotational motion; fluids at rest in motion. *Prereq.* PHY 4104.

***PHY 4106 General Physics 3** (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits; properties of light; simple optical systems. *Prereq.* PHY 4105.

***PHY 4107 General Physics Intensive** (6 cl., 6 q.h.)

Same as PHY 4104, PHY 4105, and PHY 4106. *Prereq.* MTH 4110 or concurrently.

PHY 4117 Physics 1 (Mechanics) (4 cl., 4 q.h.)

Vectors and balanced forces; accelerated motion; Newton's laws; projectile motion; work and energy; momentum; angular motion; centripetal force; rotation of rigid bodies; moment of inertia. *Prereq.* MTH 4107 or MTH 1191 or concurrently.

PHY 4118 Physics 2 (Properties of Matter, Heat, Wave Motion, Sound, Light) (4 cl., 4 q.h.)

Elasticity; density and pressure; temperature; the gas laws; heat transfer; thermodynamics; vibratory motion; wave motion; properties of sound; properties of light. *Prereq.* PHY 4117 or PHY 1191.

PHY 4119 Physics 3 (Electricity, Magnetism) (4 cl., 4 q.h.)

Electrostatics; circuit elements; direct current circuits magnetism; electromechanical devices; alternating current circuits; electronics; electromagnetic waves. *Prereq.* PHY 4118 or PHY 1192.

PHY 4173 Physics Laboratory 1 (2.3 lab., 2 q.h.)

First quarter of a two-quarter physics laboratory. Experiments in mechanics, fluid dynamics, and gas laws. *Prereq.* PHY 4105 or PHY 4118 or concurrently.

PHY 4174 Physics Laboratory 2 (2.3 lab., 2 q.h.)

A continuation of PHY 4173. Experiments in wave motion, optics, electrical circuits and nuclear and atomic physics. *Prereq.* PHY 4173.

Technical Communications

TCC 1301 Technical Communications (4 cl., 4 q.h.) (Day Curriculum)

Thought organization and effective sentences; written reports and instruction manuals; specifications and proposals; graphic aids and reproduction processes. *Prereq.* ENG 4111.

TCC 4350 Concepts of Modern Technology 1 (3 q.h.)

A survey of the applications of physical science to mechanical devices. An introduction to the laws of thermodynamics. The influence of material properties on design and manufacturing techniques. *Prereq.* MTH 4082 or equiv.

TCC 4351 Concepts of Modern Technology 2 (3 q.h.)

A survey of the applications of physical science to electrical and electronic devices. An introduction to electronic circuit design. A comparison of various devices used for amplification and control. A study of the development of the electronic digital computer and the components involved in the manufacture of computers. *Prereq.* TCC 4350.

TCC 4352 Measurement and Analysis (3 q.h.)

A survey of instruments and techniques used to assure performance of electrical and mechanical components. An introduction to trouble-shooting and automated testing. A study of destructive and nondestructive tests and their relationship to each other. *Prereq.* TCC 4350 and TCC 4351.

TCC 4353 Modern Electronics (3 q.h.)

A survey of components available to the designer of electronic devices, including linear integrated circuits and digital building blocks. Topics discussed will include: operational amplifier characteristics; truth tables and the synthesis of digital logic; logic families and specifications; counters, registers and decoding; digital instruments, digital to analog conversion. *Prereq.* TCC 4351.

TCC 4354 Theory and Operation of Computers (3 q.h.)

An introduction to digital computer design and operation. Design topics include Boolean Algebra, synthesis of switching networks, and an introduction to general computer architecture and organization. Operational topics include input and output devices, systems development, programming tools, data communication, time sharing, data-base principle. *Prereq.* MTH 4082 or equiv.



School of Engineering Technology Faculty

The strength of an educational institution lies in the quality of its faculty. This is especially true in a school devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of the School of Engineering Technology is composed of professional academicians from Northeastern University and neighboring educational institutions and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists are ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideals, and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants constitutes the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise, and assist with the administration of courses and programs.

The Faculty

The following are full-time members of the School of Engineering Technology faculty.

David J. Allen, M.S.C.E.

Assistant Professor
Computer Technology

Leroy M. Cahoon, M.S., P.E.

Program Coordinator of Civil Engineering Technology and Associate Professor of Civil Engineering

Amir Farhat, Ph.D.

Assistant Professor
Electrical Engineering Technology

David S. Goldman, M.S.

Assistant Professor
Computer Technology

Eric W. Hansberry, M.S.

Assistant Professor
Design Graphics

Israel Katz, M.S., P.E.

Professor
Engineering Technology

Nonna K. Lehmkuhl, M.S.

Program Coordinator of Computer Technology and Assistant
Professor of Computer Technology

Ernest E. Mills, M.S., P.E.

Program Coordinator of Mechanical Engineering Technology and
Associate Professor of Mechanical Engineering Technology

Thomas E. Phalen, M.S., P.E.

Associate Professor
Mechanical Engineering Technology

Leszek Reiss, M.S.

Assistant Professor
Computer Technology

Ronald E. Scott, Sc.D.

Visiting Professor
Engineering Technology

Ronald U. Telson, M.S.

Assistant Professor
Computer Technology

The following is an alphabetical list of the part-time faculty of the School of Engineering Technology; degrees earned; professional affiliation; and School of Engineering Technology department (year of appointment).

Arnold M. Aaron, B.S., M.S., Ph.D.

Engineer, Naval Underwater Systems Center
Electrical Engineering Technology (1974)

Velda Adams, B.S., M.S.

Principal Engineer, Digital Equipment Corp.
Computer Technology (1980)

***Arnold W. Almquist, Jr., B.S., M.Ed.**
Mathematics Instructor, Needham High School
Mathematics (1967)

Peter Anderson, B.S., M.S.
Senior Engineering Specialist, GTE Products Corp.
Electrical Engineering (1976)

Robert P. Anderson
Computer Specialist, United States Department of Transportation
Computer Technology (1983)

***Robert B. Angus, Jr., B.S., M.S., P.E. (Mass.)**
Principal and Consultant, Angus Associates
Electrical Engineering Technology (1947)

Francis M. Antczak, B.S.E.E.
Distribution Engineering Dept., Mass. Electric Co.
Electrical Engineering Technology (1985)

Philip H. Anthes, B.B.A., M.B.A.
Manager, Systems Integration, Computervision Corp.
Computer Technology (1985)

Oshi B. Avanesian, B.S.M.E., M.S.M.E.
Teaching Assistant, Engineering, Northeastern University
Mechanical Engineering (1985)

***Robert J. Averill, B.S., M.S.**
President, Sala Magnetics, Inc.
Course Consultant, Electrical Engineering Technology (1957)

Robert G. Backman, B.S.C.E., M.S.C.E.
Teaching Assistant, College of Engineering, Northeastern University
Civil Engineering Technology (1983)

John C. Balsavich, A.S.
Laboratory Supervisor, Electrical Engineering, Northeastern University
Electrical Engineering Technology (1957)

Henry G. Barry, M.Ed.
Department Chairman, Bigelow Junior High School, Newton, MA
Mathematics (1979)

Peter Benoit, A.E., B.S.
Principal Engineer, Polaroid Corp.
Computer Technology (1984)

*Appointed to the rank of senior lecturer.

***Matteo P. Berardi, B.S., M.S. EIT**

Assistant Chief Engineer, Stone & Webster Engineering Corp.
Mechanical Engineering Technology (1960)

Maureen P. Berggren, B.S.

Lecturer, Quincy Junior College (Part-time)
Mathematics (1965)

Donald Berkowitz, B.S.M.E., M.S.M.E.

Associate Professor, Mechanical Engineering Technology, Wentworth Institute
Mechanical Engineering Technology (1985)

Robert W. Berkstresser, B.S., M.S.

Senior Engineer, Software, Raytheon Co.
Computer Technology (1981)

Wayne M. Bethoney, B.E.T., B.S.

Mechanical Engineer, A.M.M.R.C.
Mechanical Engineering (1982)

Ralph S. Blanchard, B.S.M.E., M.S.M.E., P.E. (Mass.)

Associate Dean, College of Engineering, Northeastern University
Associate Program Consultant, Mechanical Engineering Technology (1950)

***Robert E. Bobeck, A.E., B.S., M.Ed.**

Professor, Bristol Community College
Engineering Graphics (1976)

***Edward Bobroff, B.M.E.**

Test and Start-up Manager, Cogeneration Management/Harvard University
Program Consultant, Mathematics (1946)

Michael J. Brier, B.S., M.S., M.C.S.

Engineering Tech. Staff, GTE Sylvania
Computer Technology (1985)

***Donald C. Brock, B.S., M.S.**

Mathematics Instructor, Needham High School
Mathematics (1965)

***Franklyn K. Brown, B.S.Ed., M.Ed.**

Associate Professor, Design Graphics, Northeastern University
Course Consultant, Engineering Graphics and Computation (1955)

Kip A. Brown, B.S.

Programmer/Analyst, United States Department of Transportation
Computer Technology (1982)

*Appointed to the rank of senior lecturer

Thomas J. Bugos, A.B., A.M., M.B.A., Ph.D.
Software Engineer, Prime Computer
Computer Technology (1985)

***Morris H. Burakoff, B.S., P.E. (Mass.)**
Consultant in Computer Technology, Self-employed
Computer Technology (1957)

Vincent K. Butler, B.S., B.E.T., M.S.
Assistant Manager, Data Communications Planning, NYNEX
Computer Technology (1982)

***Leroy M. Cahoon, B.S.C.E., M.S., P.E. (Mass., Conn.)**
Associate Professor of Civil Engineering, Northeastern University
Program Consultant, Civil Engineering Technology (1962)

***Frank R. Cangiano, B.S., Ed.M.**
Instructor in Science and Mathematics, Medford High School
Mathematics (1957)

**Joseph M. Cardito, B.S., M.S., Ph.D., P.E. (Mass.), C.H.P.
(American Board of Health Physics)**
Supervisor, Nuclear Fuels and Data Systems, Stone & Webster
Engineering Corp.
Mechanical Engineering Technology (1978)

Robert W. Case, Ph.D.
Coordinator for Day Program, School of Engineering Technology
Mathematics (1976)

***Walter J. Casey, A.B., M.Ed., M.A.T.**
Mathematics Teacher, Brighton High School
Mathematics (1955)

Joan M. Chrusciel, B.S., M.Ed., M.A.
Mathematics Teacher, Quincy High School
Mathematics (1980)

Vincent L. Cocco, B.S.
Senior Engineer, Polaroid Corp.
Mechanical Engineering Technology (1978)

Thomas C. Coleman, B.S.M.E., M.S.M.E., Ph.D., P.E. (Mass.)
Senior Project Engineer, Charles T. Main, Inc.
Course Consultant, Mechanical Engineering Technology (1960)

Robert P. Collins, B.S., M.Ed., D.Ed.
Grants Coordinator, Boston Public Schools
Mathematics (1981)

*Appointed to the rank of senior lecturer.

Wendell R. Collymore

Electronic Engineering Design CAD/CAM, Polaroid Corp.
Engineering Graphics (1976)

Robert J. Cormier, B.S.

Site Planner & Land Architect, Stone & Webster Engineering Corp.
Civil Engineering Technology (1984)

***Leonard M. Conlin, A.B., Ed.M.**

Mathematics Teacher, Framingham North High School
Mathematics (1967)

***Roger T. Connor, A.B., M.Ed.**

Teacher, Milton Academy
Course Consultant, Calculus (1953)

***Joseph Z. Cooper, B.S.E.E.**

Principal Engineer, Raytheon Co.
Computer Technology (1967)

***James B. Corscadden, B.S., M.Ed., A.M.T.**

Assistant Headmaster, South Boston High School
Mathematics (1967)

William L. Crenshaw, B.S.M.E., M.S.M.E., P.E. (Mass.)

Research Mechanical Engineer, Army Materials and Mechanics
Research Center
Mechanical Engineering Technology (1980)

***David C. Crockett, B.S., M.S.**

Senior Engineer, Raytheon Co.
Mechanical Engineering Technology (1969)

Steven Cushing, S.B., M.A., Ph.D.

Assistant Professor, St. Anselm College, Computer Science Dept.
Computer Technology (1982)

Gregory Czarnowski, A.B., M.Ed.

Advertising Executive, Auld Associates
Technical Communications (1982)

Francis H. Daly, B.S.I.T., M.Ed.

Chairman, Electronics Dept., Waltham Vocational Technical High
School
Electrical Engineering Technology (1986)

***Thomas R. Deveney, B.S., M.A.**

Manager, Boston Public Schools
Mathematics (1965)

*Appointed to the rank of senior lecturer.

Jane E. DeVoe, B.S., M.A.

Lecturer in Mathematics

Mathematics (1980)

Douglas H. Diamond, B.E.E., M.S.

Program Manager, Analytical Systems Engineering Corp.

Mathematics (1968)

Raffaele Di Cecca, B.A., M.A., M.A.

Assistant Professor, Wentworth Institute of Technology

Mathematics (1982)

***Giles C. Dilg, B.S.E.E., M.S.E.E., P.E. (Mass.)**

Manager, Honeywell Information Systems

Engineering Graphics (1966)

***Mark Domaszewicz, B.E.E., M.S.E.E.**

Senior Engineer, Raytheon Co.

Mathematics (1970)

Jeffrey A. Donahue, B.S.E.E., M.E.

Engineer, New England Power Service Co.

Electrical Engineering Technology (1983)

***Leonard F. Dow, B.S.E.E., M.S., P.E. (Mass.)**

Staff Engineer, Boston Edison Co.

Electrical Engineering Technology (1970)

Philip W. Dunphy, B.Sc., M.Ed.

Associate Professor, Cooperative Education, Northeastern University

Academic Counselor (1967)

David P. Durant, B.S., M.Ed., M.S.

Teacher, City of Boston

Mathematics (1983)

***William V. Durante, B.S., M.Ed., M.A.**

Assistant Headmaster of Mathematics, Boston Latin School

Course Consultant, Mathematics (1964)

***Henry B. Eden, B.S.**

President Anco Boston, Inc.

Engineering Graphics (1957)

Walter E. Engstrom, B.S., M.S.

Physics Instructor, Braintree High School

Physics (1985)

*Appointed to the rank of senior lecturer.

Ben Erfany, B.S.E.E., M.S.E.E.
Research Scientist, Raytheon Company
Electrical Engineering Technology (1986)

***Adolf J. Erikson, B.B.A., M.B.A., P.E. (Mass.)**
President, A.E. Engineering Corp.
Engineering Graphics (1966)

Gordon C. Estabrooks, A.B., M.A., M.Ed.
Physics Instructor, Boston School Department
Physics (1983)

Andreas L. Evriviades, B.S., M.A.
Teacher of Mathematics, Milton Academy
Mathematics (1983)

Robert Fakhri, B.S.C.E., M.S.C.E.
Teaching Assistant, Northeastern University
Civil Engineering Technology (1985)

Thomas C. Fantasia, M.S.E.E., B.S.E.E.
Electrical Engineering, Boston Edison Co.
Electrical Engineering Technology (1981)

Edwin H. Farr, B.S., M.S., Ph.D.
United States Dept. of Transportation
Mathematics (1980)

Werner Feibel, B.A., M.S., Ph.D.
Software Editor, Addison-Wesley Publishing Co.
Computer Technology (1985)

Daniel J. Fennelly
Branch Systems Engineer Manager, Data General Corp.
Computer Technology (1985)

***William D. Finan, A.B., M.A., D.Ed.**
Reading Director, Needham Public Schools
Course Consultant, Mathematics (1946)

***Louis A. Fiore, A.E., B.B.A.**
Chief Draftsman, American Science and Engineering, Inc.
Engineering Graphics (1956)

John M. Flaherty, B.S., M.S., Ph.D.
Engineering Specialist, GTE Sylvania
Electrical Engineering Technology (1976)

Constantine Fountzoulas, B.S., M.S.
Lecturer, Northeastern University
Mechanical Engineering Department (1985)

*Appointed to the rank of senior lecturer.

John J. Fraizer, B.S.
Senior Engineer, Raytheon Co.
Physics (1981)

Lewis J. Fusegni, B.S.M.E., M.S.M.E.
Senior Power Engineer, Stone & Webster Engineering Corp.
Mechanical Engineering Technology (1983)

Kenneth Gagnon, B.S.
Lecturer in Chemistry, Northeastern University
Physics (1983)

Hassan Gharavy, B.S.E.E, M.S.E.E.
Assistant Professor, Mass Bay Community College
Computer Technology (1986)

***Peter D. Gianino, B.S., M.S.**
Research Physicist, R.A.D.C., Hanscom Air Force Field
Course Consultant, Differential Equations (1980)
Mathematics (1965)

***Sheldon L. Glickler, B.S., M.S.**
Program Manager, G.C.A. Corp.
Mechanical Engineering Technology (1969)

***David Goldberg, B.S., M.S.E.E., M.S.E.M.**
Program Manager, GTE Sylvania
Course Consultant, Engineering Graphics (1969)

Bernard F. Goldstein, B.S., M.S., Ph.D.
Senior Analyst, Dynamics Research Corp.
Electrical Engineering Technology (1974)

Gustavo A. Gorrochotegui, A.S., B.E.T.
Quality Assurance Engineer, Texas Instruments
Mechanical Engineering Technology (1982)

Philip R. Haberstroh, B.S.Ed., M.S.Ed.
Teacher of Mathematics, Boston Latin School
Mathematics (1981)

W. Dale Hall, Ph.D.
Member, Technical Staff, MITRE Corp.
Mathematics (1981)

Pamela Halpern, B.A., M.S., M.S.
Vice President, Comp-All Systems, Inc.
Computer Technology (1986)

*Appointed to the rank of senior lecturer.

Gerald Halstead, B.S.E.E., M.S.E.E.
Technical Staff, GTE Government Systems
Electrical Engineering Technology (1985)

***Francis R. Hankard, S.B., M.A.**
Assistant Chief of Lab., Mass. Department of Public Safety
Program Consultant, Physics (1946)

Deborah Harper, B.S., M.A.
Self-Employed, Island Consulting Firm
Technical Communications (1985)

Richard J. Hart, B.S.Ed., M.Ed.
Computer Education Coordinator, Stone & Webster Engineering Corp.
Computer Technology (1983)

Howard Hill
Teacher of Mathematics, Needham High School
Mathematics (1982)

Lewis H. Holzman, B.S.C.E., S.M.C.E., P.E. (Mass.), R.L.S. (Mass.)
Consultant, Computer Department, Stone & Webster Engineering Corp.
Computer Technology (1966)

C. Gregory Hood, B.S., M.A., Ph.D.
Newton Public Schools
Physics (1975)

Abdo Ibrahim, Ph.D.
Professor, Boston University
Physics (1984)

***Charles E. Jacob, B.S.E.E., M.S.Ed., M.L.S.**
Master, Boston Latin School
Physics (1967)

John Joseph Joyce, B.S., M.Ed., M.A.
Teacher of Mathematics, Winchester High School
Mathematics (1983)

***John Kaczorowski, Jr., B.S.E.E., M.S.E.E.**
Assistant Director, Northeastern University
Associate Program Consultant, Electrical Engineering Technology (1970)

Phillip T. Karatzas, A.E., B.S., M.S.
Senior Radiological Engineer, Boston Edison Co.
Physics (1978)

*Appointed to the rank of senior lecturer.

***Leon Katler, Certificate P.E. (Mass., Maine, N.Y., Penn., Va.)**
Consultant, Structural Engineering, Self-employed
Civil Engineering Technology (1963)

***Louis Katona, B.C.E., M.C.E., P.E. (Mass., N.Y.)**
Senior Hydraulic Engineer, Badger America, Inc.
Civil Engineering Technology (1959)

John G. Kelly, B.S.
Computer Specialist, William M. Mercer, Inc.
Computer Technology (1982)

***George F. Kent, B.S., M.S., M.B.A., P.E. (Mass., Conn.)**
Department Manager, Continuing Education
Course Consultant, Materials (1962)

David E. Kentley
Visiting Lecturer, University of Lowell
Electrical Engineering Technology (1985)

***Bernard J. Kiley, B.E., M.E., P.E. (N.H., Mass., Conn.)**
Senior Structural Engineer, Stone & Webster Engineering Corp.
Mechanical Engineering Technology (1958)

Joseph C. LaCroix, B.A., M.Ed., C.A.G.S.
Chairman, Mathematics Department, Dorchester High School
Mathematics (1974)

Peter P. LaGrassa, B.S.I.T.
Senior Engineer, Information Systems Div., Honeywell Inc.
Computer Technology (1982)

***Robert S. Lang, B.S., Ed.M.**
Associate Professor, Engineering Design Graphics,
Northeastern University
Course Consultant, Engineering Graphics (1955)

James Leavitt, B.S.C.E.
Engineer, U.S. Department of Transportation
Computer Technology (1984)

Eui I. Lee, B.S., M.S., Ph.D.
Staff Member, MIT Lincoln Lab
Computer Technology (1985)

*Appointed to the rank of senior lecturer.

Nonna K. Lehmkuhl, M.S.

Program Coordinator of Computer Technology and Assistant
Professor of Computer Technology
School of Engineering Technology Day and Evening Programs (1973)

Alvin J. Lesieur, B.E.T., B.S., M.Ed.

Instructor, Instron Corp.
Engineering Graphics (1965)

***Sandra M. Lictor, B.S., M.S., C.S., M.Ed.**

Software Engineer, Raytheon Co.
Mathematics (1967)

***Demetre P. Ligor, B.S.E.E., P.E. (Mass.)**

President, Applied Measurements, Inc.
Course Consultant, Physics (1959)

Warren J. Little, B.S., M.S.

Technical Staff, Charles Stark Draper Labs., Inc.
Physics (1966)

George M. Livingstone, Jr., B.S.

Private Practice
Civil Engineering Technology (1975)

Bertram S. Long

Associate Professor Mechanical Engineering,
Northeastern University
Associate Program Consultant, Mechanical Engineering Technology (1975)

***Roger G. Long, A.E., B.B.A., P.E. (Mass.)**

Senior Staff, Arthur D. Little, Inc.
Electrical Engineering Technology (1952)

Phillip A. LoPresti, B.S.E.E., M.S.E.E.

Engineer Supervisor, NEC Electronics Inc.
Electrical Engineering Technology (1985)

William Loring, B.E.T.

Design Engineer, Computer Aided Design, Teradyne, Inc.
Computer Technology (1985)

***John F. Lutkevich, A.E., B.B.A.**

Engineer-in-Charge, GTE Sylvania
Engineering Graphics (1956)

*Appointed to the rank of senior lecturer.

Eliot A. Madow, A.S.E.E., B.E.T.
Systems Analyst, Simonds Cutting Tools
Computer Technology (1985)

***Jack I. Mann, B.S., M.S., P.E. (Mass., Vt., Penn., Conn., Wyo., Ind., Ohio, Va., Tenn., N.H., N.J., W.Va.)**
Structural Engineer, United Engineers & Constructors, Inc.
Mechanical Engineering Technology (1961)

Rajendra K. Mathur, B.S., B.S.C.E., M.S.C.E., P.E. (MA)
Consultant, Stone & Webster Engineering Corp.
Mechanical Engineering Technology (1985)

Anton Mavretic, B.S., M.S., Ph.D.
Associate Professor, Boston University
Electrical Engineering Technology (1969)

Michal V. McAulay
Manager of Advertising and Public Relations Department, H4P Co.
Technical Communications (1980)

Donald P. McCarthy, Jr., B.S., M.S.
Electronic Engineer, Sanders Assoc.
Electrical Engineering Technology (1985)

***Carl J. Mellea, S.B., M.S., P.E. (Mass., R.I., Maine, Vt., N.H.)**
Project Engineer; Howard, Needles, Tammen & Bergendorff
Civil Engineering Technology (1960)

Robert L. Meserve, B.S., M.S.
Associate Professor, Civil Engineering, Northeastern University
Civil Engineering Technology (1978)

Philip N. Milan
Project Manager, Henkels & McCoy, Inc.
Telecommunications (1985)

***Ernest E. Mills, B.S., M.S., P.E. (Mass.)**
Program Coordinator of Mechanical Engineering Technology and
Associate Professor of Mechanical Engineering Technology
School of Engineering Technology, Day and Evening Programs (1946)

***Louis A. Moore, A.E., B.E.T., B.S.C.E., R.L.S. (Mass.)**
Chief Engineer, Commonwealth of Mass., Land Court, Boston
Civil Engineering Technology (1972)

Robert J. Nelson, B.S.E.E., M.E.
Electrical Engineer, Boston Edison Co.
Electrical Engineering Technology (1985)

*Appointed to the rank of senior lecturer.

***Ray O. Oglesby, B.S.Ed., M.S.Ed.**
Teacher, Newton North High School
Mathematics (1967)

***Yesugey Oktay, B.S., M.S., P.E. (Mass., N.Y., Calif., Maine)**
Division Head, Mechanical & Structural Engineering, Boston Edison Co.
Civil Engineering Technology (1970)

Douglas J. Ordway, B.A., M.Ed.
Teacher, Boston Public Schools
Mathematics (1975)

***Thomas J. Owens, A.B., M.Ed.**
Instructor in Mathematics, Quincy High School
Mathematics (1952)

John P. Page, A.B., M.Ed., A.M.
Teacher of Mathematics, Boston Latin School
Mathematics (1980)

***William H. Parmenter, A.E., B.B.A.**
Retired
Electrical Engineering Technology (1952)

Francis A. Pepicelli, A.E., B.S.
Engineer, Northrop Corp.
Mechanical Engineering Technology (1976)

Walter J. Phinney, A.E., B.E.T., M.B.A.
Manager, Product Design, Raytheon Co.
Mechanical Engineering Technology (1977)

***Dominic A. Piccione, B.S., M.S.P.E. (Mass., Va.)**
Senior Engineer, Stone & Webster Engineering Corp.
Mechanical Engineering Technology (1966)

Richard H. Pike, B.S.I.E., M.B.A.
Management Consultant, Self-employed
Industrial Engineering (1980)

***Norman C. Poirier, B.S., M.S., P.E. (Mass.)**
Research Associate, Northeastern University
Electrical Engineering Technology (1966)

Donald J. Poulin, A.E., B.S.I.T., P.E. (Mass.)
Senior Test Engineer, Kollsman Institute
Electrical Engineering Technology (1970)

*Appointed to the rank of senior lecturer.

***Daniel W. Pratt, B.S., M.S.**

Director of Computer Science, Boston Latin School
Mathematics (1967)

***Charles H. Price, Jr., B.S.E.E., M.S.E.E.**

Technical Staff, MITRE Corp.
Course Consultant, Electrical Engineering Technology (1960)

Robert Rancourt, B.S., M.S.E.E.

Electrical Engineer, MITRE Corp.
Mathematics (1984)

James F. Regan, B.S.C.E., M.S.C.E., P.E. (Mass.)

President, Keefe & Regan Engineers, Inc.
Civil Engineering Technology (1972)

***Edward L. Rich, B.S., M.S., P.E. (Mass.)**

Program Control Manager, Raytheon Co.
Mechanical Engineering Technology (1956)

Edward Ricupero, A.B., M.Ed.

Head of Mathematics Department, Everett High School
Mathematics (1983)

Robert J. Ritchie, A.E., B.S.

Computer Graphics Supervisor, Boston Edison Co.
Engineering Graphics (1980)

Robert Rosenberg, S.B., S.M., Sc.D.

Engineering Consultant, Stone & Webster Engineering Corp.
Mechanical Engineering Technology (1983)

***Eric A. Roy, A.B., M.Ed., M.A.**

Instructor, Archdiocese of Boston
Mathematics (1967)

***Thomas E. Ruden, B.S., M.S.**

Physicist, Varian Associates, Inc.
Physics (1967)

Lawrence H. Ryan, B.S.E.E., M.S.E.E.

Senior Product Engineer, Foxboro Company
Computer Technology (1985)

***Leo D. Salvucci, A.B., M.Ed., M.S.T.**

Mathematics Teacher, Boston Latin School
Mathematics (1965)

*Appointed to the rank of senior lecturer.

Annino Salvucci, Drafting Certificate, A.E.
Equipment Design Engineer, Honeywell, Inc.
Engineering Graphics (1983)

Bernard J. Schmitz, B.S.
Retired Senior Software Analyst, Honeywell, Inc.
Computer Technology (1985)

Robert G. Schultz, B.E.T.
Computer Hardware Engineer, Northrop Corp.
Computer Technology (1985)

Stephen Schwarm, B.S.E.E.
Software Manager, Axiom Technology
Computer Technology (1985)

Michael J. Scipione, B.S.C.E., M.S.C.E.
Associate Project Engineer, Western & Sampson
Civil Engineering Technology (1984)

John W. Shaw, A.S.
Technician, Electrical Engineering, Northeastern University
Electrical Engineering Technology (1985)

***Walter S. Shields, B.S., Ed.M., M.S., M.Ed.**
Mathematics Instructor, Needham Public Schools
Mathematics (1966)

Jerry Silverman, B.S., Ph.D.
Deputy Electronic Technician, Hanscom Air Force Base
Mathematics (1985)

M. Daniel Simkovitz, B.S.E.E., M.S.
Manager, Communication Services Academic Computer,
Northeastern University
Computer Technology (1986)

Melvin W. Simms, M.B.A., Ed.M., Ed.D.
Assistant Professor and Coordinator, Northeastern University
Mathematics (1983)

James Singletery, Jr., B.S.E.E., M.S., M.S.E.E.
Research Engineer, Solid State Laboratories
Electrical Engineering Technology (1985)

Ronald Skilton, B.S.
Computer Specialist, Stone & Webster Engineering Corp.
Computer Technology (1983)

*Appointed to the rank of senior lecturer.

***Benjamin R. Stahl, B.A.**

Senior Systems Analyst, Raytheon Data Systems Co.
Computer Technology (1966)

***Joseph E. Steffano, Sr., B.S., M.S., M.B.A., P.E. (Mass., Vt., N.H., Conn., Maine, R.I., N.Y., Penn.), R.L.S. (Mass., Conn., N.H., Maine, R.I., Vt.)**

Chief Engineer, Stone & Webster Engineering Corp., Structural Division
Civil Engineering Technology (1965)

Harold J. Stengel, S.B.

Secondary Teacher in Mathematics, Boston Latin Academy
Mathematics (1982)

***M. Carlton Storms, B.A., M.Ed.**

Teacher, Braintree High School
Physics (1967)

***Raimundas Sukys, B.S., M.S.**

Senior Research Associate in Electrical Engineering, Northeastern University
Course Consultant, Electrical Engineering Technology (1962)

Donald M. Sullivan, Jr., B.S., M.Ed.

Instructor, Dedham High School
Mathematics (1984)

Robert C. Sullivan, A.S.

Retired Engineer Manager, New England Telephone
Telecommunications (1985)

David G. Sveden, B.A., M.Ed.

Math Instructor, Town of Needham
Mathematics (1979)

Jerome Tapper, A.S.E.E., B.S.E.E.

Chief Electrical Engineer, ARK-LES Corp.
Electrical Engineering Technology (1982)

***Jason R. Taylor, B.S., M.S.**

Assistant Professor, Bentley College
Mathematics (1966)

***John S. Travia, B.S.E.E., M.S.E.E., P.E. (Mass.)**

Senior Engineer, Raytheon Co.
Electrical Engineering Technology (1965)

*Appointed to the rank of senior lecturer.

Edward P. Tribuna, B.E.T., F.A.A., A&P Certificate
Aircraft Mechanic/Computer Programmer, Digital Equipment Corp.
Electrical Engineering Technology (1985)

***John F. Videler, B.S., M.S.**
Manager, Instrument Standards and Controls, General Electric Co.
Physics (1968)

Marianne Walpert, B.S., M.S.
Software Developer, Sun Sailor Designs
Physics (1985)

James T. Welch, B.S.E.E, M.S.
Technical Staff, MITRE Corp.
Computer Technology (1977)

***Joseph F. Willard, B.S., P.E. (Mass.), R.L.S. (Mass.)**
Associate Civil Engineer, Massachusetts Department of Public Works
Civil Engineering Technology (1949)

***Albert G. Wilson, B.S., M.S., P.E. (Mass.), S.E. (Ill.)**
Structural Engineer, Stone & Webster Engineering Corp.
Course Consultant, Mechanical Engineering Technology (1948)

Alex Wilson, B.S., M.A.
Programming Consultant
Computer Technology (1986)

***Jacob Wiren, B.S., M.S., P.E.**
Retired
Computer Technology (1950)

Susan Wood, B.S.E.E.
Technical Staff, MITRE Corp.
Computer Technology (1984)

Kenneth S. Woodard, B.S., M.E.
Associate Professor, Design Graphics, Northeastern University
Aerospace Adviser, School of Engineering Technology
Academic Counselor (1967)

Robert A. Yahn, Jr., B.S.E.E., M.S.E.E.
Systems Engineer, U.S. Air Force, Hanscom Air Force Base
Electrical Engineering Technology (1985)

*Appointed to the rank of senior lecturer.

***Walter Zagieboylo, M.S., M.E., P.E. (Mass.), M.A.A.**

Town Appraiser and Assessor, Wrentham, Mass.

Mathematics (1969)

***Walter P. Zanol, B.S.B.A.**

Instructor, Everett High School

Mathematics (1967)

Mansour Zenouzi, B.S., M.S., Ph.D.

Mechanical Engineering Department, Northeastern University

Mechanical Engineering Technology (1984)

*Appointed to the rank of senior lecturer.

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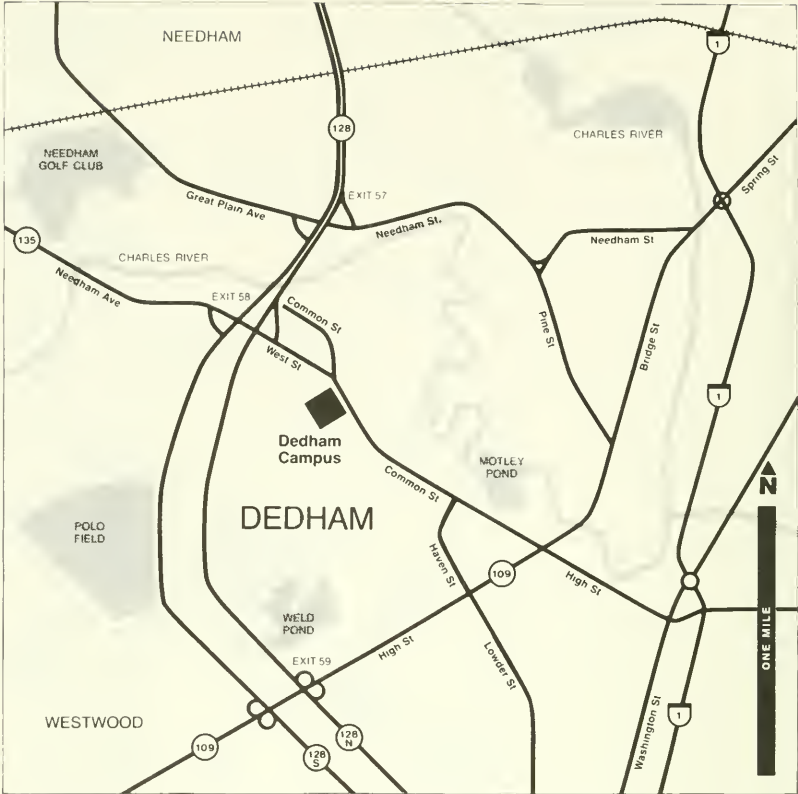
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Westwood



Weymouth





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School of Engineering Technology
Northeastern University
1986-1988



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Part – time

Undergraduate

Programs

Northeastern

University

1986 – 1987

University College Bulletin

Northeastern University

**Part-time Programs
1986–1987**

**Part-time day and evening
undergraduate programs in:**

Business Administration

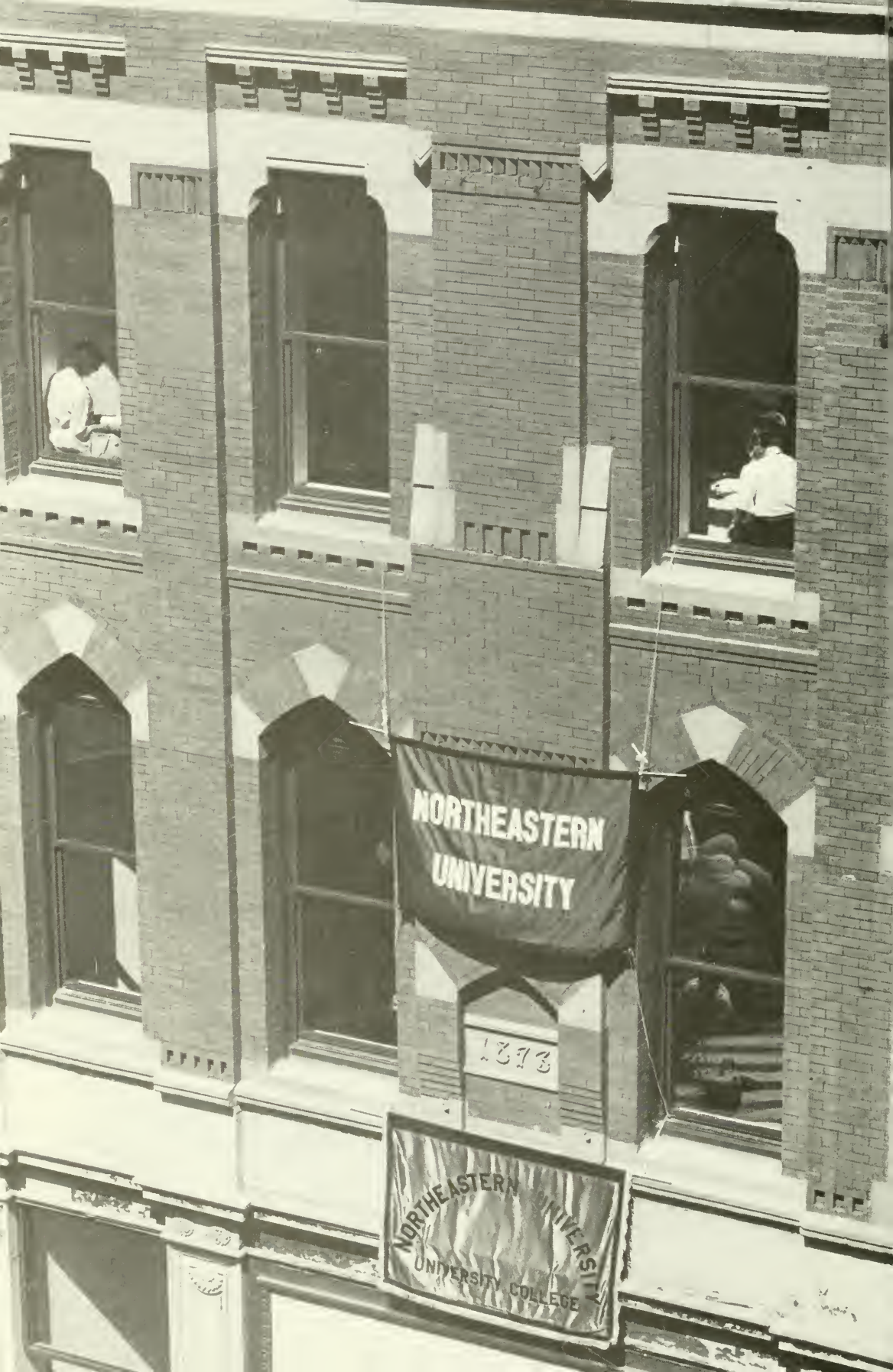
Health Professions and Sciences

Law Enforcement

Liberal Arts

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NORTHEASTERN
UNIVERSITY

1273

NORTHEASTERN UNIVERSITY
UNIVERSITY COLLEGE

1986–1987 Academic Calendar

Fall Quarter 1986

Classes begin Monday, September 29, 1986

Fall Registration Dates

Belmont High School

Wednesday, September 3, and
Tuesday, September 9,
5:30–8 pm

Boston Main Campus

Tuesday–Friday,
September 2–5,
5–7:30 pm
Saturday, September 6,
9 am–12 noon
Monday–Wednesday,
September 8–10, and 15–17
5–7:30 pm

Downtown Boston Campus

(5 Liberty Square)
Tuesday–Tuesday,
September 2–9,
11 am–6:30 pm

Brockton High School

Wednesday, September 3, and
Monday, September 8,
5:30–8 pm

Burlington Suburban Campus

Thursday, September 4,
5:30–8 pm
Friday, September 5,
12–3 pm and 5:30–8 pm
Monday–Tuesday, September 8–9,
5:30–8 pm

Chelmsford High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 pm

Dedham Campus

Thursday, September 4, and
Tuesday, September 9,
5:30–8 pm

Framingham North High School

Tuesday, September 2, and
Monday, September 8,
5:30–8 pm

Lynnfield Middle School

Wednesday, September 3, and
Monday, September 8,
5:30–8 pm

Marlboro High School

Wednesday, September 3, and
Monday, September 8,
5:30–8 pm

Marshfield High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 pm

Milford High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 pm

Revere High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 pm

Westwood High School

Thursday, September 4, and
Tuesday, September 9,
5:30–8 pm

Weymouth North High School

Wednesday, September 3, and
Monday, September 8,
5:30–8 pm

Fall quarter classes begin
Monday, September 29

Columbus Day observed
Monday, October 13

Veterans Day observed
Tuesday, November 11

Thanksgiving recess
Thursday–Sunday, November 27–30

Final examination period for fall quarter
Monday–Sunday, December 15–21

Christmas vacation
Monday–Sunday, December 22–January 4

Winter Quarter 1987

Classes begin Monday, January 5, 1987

Winter Registration Dates

Belmont High School

Tuesday, December 9,
5:30–8 pm

Boston Main Campus

Monday–Thursday,
December 8–11,
5–7:30 pm

Downtown Boston Campus

(5 Liberty Square)
Monday–Thursday,
December 8–11,
11 am–6:30 pm

Brockton High School

Monday, December 8,
5:30–8 pm

Burlington Suburban Campus

Monday–Thursday,
December 8–11,
5:30–8 pm

Chelmsford High School

Tuesday, December 9,
5:30–8 pm

Dedham Campus

Monday–Tuesday,
December 8–9,
5:30–8 pm

Framingham North High School

Monday–Tuesday,
December 8–9,
5:30–8 pm

Lynnfield Middle School

Monday, December 9,
5:30–8 pm

Marlboro High School

Monday, December 8,
5:30–8 pm

Marshfield High School

Tuesday, December 9,
5:30–8 pm

Milford High School

Tuesday, December 9,
5:30–8 pm

Revere High School

Tuesday, December 9,
5:30–8 pm

Westwood High School

Tuesday, December 9,
5:30–8 pm

Weymouth North High School

Tuesday–Wednesday,
December 9–10,
5:30–8 pm

Winter quarter classes begin
Monday, January 5

Martin Luther King Jr.'s Birthday observed
Monday, January 19

Presidents' Day observed
Monday, February 16

Final examination period for winter quarter
Monday–Sunday, March 23–29

Spring recess (or make-up period for lost
snow days)
Monday–Sunday, March 30–April 5

Spring Quarter 1987

Classes begin Monday, April 6, 1987

Spring Registration Dates

Belmont High School

Tuesday, March 17,
5:30–8 pm

Boston Main Campus

Monday–Thursday,
March 16–19,
5–7:30 pm

Downtown Boston Campus

(5 Liberty Square)
Monday–Thursday,
March 16–19,
11 am–6:30 pm

Brockton High School

Wednesday, March 11,
5:30–8 pm

Burlington Suburban Campus

Monday–Thursday,
March 16–19,
5:30–8 pm

Chelmsford High School

Tuesday, March 17,
5:30–8 pm

Dedham Campus

Monday, March 16, and
Wednesday, March 18,
5:30–8 pm

Framingham North High School

Monday–Tuesday,
March 16–17,
5:30–8 pm

Lynnfield Middle School

Monday, March 16,
5:30–8 pm

Marlboro High School

Monday, March 16,
5:30–8 pm

Marshfield High School

Tuesday, March 17,
5:30–8 pm

Milford High School

Tuesday, March 17,
5:30–8 pm

Revere High School

Tuesday, March 17,
5:30–8 pm

Westwood High School

Tuesday, March 17,
5:30–8 pm

Weymouth North High School

Monday, March 16, and
Wednesday, March 18,
5:30–8 pm

Spring quarter classes begin

Monday, April 6

Patriots' Day observed

Monday, April 20

Memorial Day observed

Monday, May 25

Final examination period for spring quarter

Monday–Sunday, June 15–21

Commencement

Sunday, June 21

Summer Quarter 1987

Classes begin Monday, June 22, 1987

Registration for Entire Summer Quarter**Boston Main Campus**

Monday–Thursday,
June 8–11,
5–7:30 pm

Burlington Suburban Campus

Monday–Wednesday,
June 8–10,
5:30–8 pm

Registration for Second Five–Week Summer Term**Boston Main Campus**

Monday–Tuesday,
July 13–14,
5:30–8 pm

Burlington Suburban Campus

Monday, July 13,
5:30–8 pm

Summer quarter classes begin

Monday, June 22

Second summer quarter session classes begin

Monday, July 27

Independence Day observed

Saturday, July 4

Labor Day observed

Monday, September 7

Final examination period for summer quarter

Held during last class session of each term

Calendar changes may be made. The University community will be notified if such changes occur.



Introduction

How to Use this Book

The University College *Bulletin* is divided into five major sections: this Introduction and Programs of Study, Course Descriptions, Academic Policies and Services, and General Information. These first few pages offer a brief introduction to University College and include a list of its office hours and locations. The four remaining sections are described below.

Programs of Study

This section contains the curriculum for each program offered by University College. The section is subdivided into five major areas: Certificate Programs, Business Administration Degree Programs, Health Professions and Sciences Degree Programs, Law Enforcement Degree Programs, and Liberal Arts Degree Programs. These subsections contain general information about each program area and descriptions of each program offered.

Program descriptions contain the title of the program, the degree available, and all of the courses required to complete the program. Total quarter hours for each class and for the program as a whole are also listed. Students interested in pursuing a certificate or a degree in a given area should consult the program description to plan the sequence in which to take required, recommended, and elective courses.

Course Descriptions

The content of each course available at University College is listed in this section. Courses are listed alphabetically by subject area and are identified by course numbers composed of two parts: a department code (in letters) and four numbers. Course numbers are followed by the full name of the course and the quarter hours of credit offered. Course descriptions include the official version of the course's content and list

prerequisites necessary for enrollment, if any. A complete list of department codes can be found at the beginning of the course description section on page 118. A sample course description looks like this:

ACC 4110 Management Control for Nonprofit Organizations (3 q.h.)

Characteristics of management control in nonprofit organizations. Studies input-output measures, pricing, budgeting, and accounting control. For non-accounting majors. *Prereq.* ACC 4102.

Academic Policies and Services

This section contains information on various areas of interest to potential students, including who to call for help getting started. If you need to know the details on admission policies, transfer credit, the grading system, tuition and fees, scholarships and financial aid, student activities, and more, consult this section.

General Information

This section provides information on Northeastern University's nine colleges and graduate schools, its facilities, officers and governing boards, a list of University College faculty members, and maps to each of its 16 different campus locations.

University College

John W. Jordan, *Dean*
 Robert W. O'Connor,
Associate Dean for Academic Programs
 Ralph T. Vernile, Jr.,
Associate Dean for Administration

The Programs

University College is committed to the education of mature adult students who wish to live effectively in today's complex society. The College's programs are constantly evaluated and updated to satisfy the changing professional, cultural, and social needs and interests of adults.

Degree programs have been developed in over 30 major fields of study in the areas of business administration, health professions and sciences, law enforcement, and liberal arts. Courses are offered on a convenient, part-time basis throughout the week during the day and the evening. Students may take single courses, pursue a certificate program, or enroll in full degree programs leading to the associate's or bachelor's degree. Short-term seminars are also offered for credit. Classes are scheduled at a number of accessible locations.

The Faculty

Approximately 1,500 men and women constitute the part-time teaching staff of University College. Included are members of the full-time faculty of Northeastern University and other educational institutions in New England as well as outstanding New England business and professional leaders with training and experience in specialized areas.

The Student Body

Approximately 15,000 students, ranging in age from 18 years to beyond retirement, enroll in University College each year. The diversity of

the student body is a source of stimulation and enrichment for all—students, faculty, and administrators alike—who become a part of the University College community.

University College Offices

General Information

617-437-2400

Regular Office Hours

Office of the Registrar

120 Hayden Hall
 617-437-2300
 Monday–Thursday
 8:30 am–8 pm
 Friday
 8:30 am–4:30 pm

Belmont High School

221 Concord Avenue
 617-484-4418
 Tuesday–Thursday
 5:30–10 pm

Boston Main Campus

180 Ruggles Building
 360 Huntington Avenue
 617-437-2400
 Monday–Friday
 8:30 am–8:30 pm
 Saturday
 8:30 am–1 pm
 Sunday
 9:30 am–1:30 pm

Downtown Boston Campus

5 Liberty Square
 617-367-6373
 Monday–Friday
 7 am–10 pm
 Saturday
 8:30 am–1:30 pm

Brockton High School

470 Forest Avenue
 617-584-2444
 Monday and Wednesday
 5:30–10 pm

Burlington Suburban Campus

South Bedford Road
617-272-5500

Monday–Friday

8 am–10 pm

Saturday

8 am–1 pm

Sunday

9:30 am–1:30 pm

Burlington High School

123 Cambridge Street
617-273-1870

Monday–Thursday

5:30–10 pm

Chelmsford High School

200 Richardson Road
617-251-8792

Tuesday and Thursday

5:30–10 pm

Dedham Campus

370 Common Street
617-329-8000

Monday–Friday

8 am–10 pm

Saturday

8 am–1 pm

Framingham North High School

A Street
617-877-2333

Monday–Thursday

5:30–10 pm

Lynnfield Middle School

505 Main Street
617-334-6027

Monday and Wednesday

5:30–10 pm

Marlboro High School

Bolton Street
617-485-4122

Monday and Wednesday

5:30–10 pm

Marshfield High School

Forest Street
617-837-1835

Tuesday and Thursday

5:30–10 pm

Saturday

8:30 am–2 pm

Milford High School

31 West Fountain Street
617-473-2565

Tuesday and Thursday

5:30–10 pm

Revere High School

101 School Street
617-289-8113

Monday, Tuesday, and Thursday

5:30–10 pm

Westwood High School

200 Nahatan Street
617-329-3030

Monday–Thursday

5:30–10 pm

Weymouth North High School

1051 Commercial Street
617-335-9112

Monday–Thursday

5:30–10 pm

Summer Office Hours**Office of the Registrar**

120 Hayden Hall
Monday–Thursday
8:30 am–8 pm

Boston Main Campus

180 Ruggles Building
Monday–Thursday
8 am–8:30 pm

Downtown Boston Campus

5 Liberty Square
Monday–Thursday
7:30 am–10 pm

Burlington Suburban Campus

Monday–Thursday
8 am–10 pm

Dedham Campus

Monday–Thursday
8 am–10 pm
Friday
8:30 am–4:30 pm

Framingham North High School

Monday and Wednesday
5:30–10 pm

Weymouth North High School

Tuesday and Thursday
5:30–10 pm



Programs of Study

Program Introduction

University College conducts part-time educational programs at the undergraduate level during the day and the evening. The programs are designed to help meet the varying needs and interests of adult students who may enroll as students pursuing degree programs or as non-degree students taking single courses or special programs.

University College programs leading to the Bachelor of Science, Bachelor of Science in Business Administration, and Bachelor of Arts degrees provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students. The bachelor's degree requires approximately 174 quarter hours of credit.

Programs leading to the Associate in Science degree help provide students with a background in fundamental areas in business administration, health professions and sciences, law enforcement, and liberal arts. The associate's degree requires 96 quarter hours of credit and is equivalent to the conventional two-year, or junior, college in scope and quality. Certificate programs in a variety of disciplines are also offered.

Degree and certificate programs are offered in the following areas:

Business Administration

Accounting

Associate in Science 26
Bachelor of Science in Business
Administration 27
Certificate 12

Business Administration

Associate in Science 28

Compensation and Benefits Management

Certificate 13

Computer Programming and Systems Analysis
Certificate 13

Computer Systems Specialist Program
Certificate 14

Finance

Associate in Science 29
Certificate 15

Hotel and Restaurant Management

Associate in Science 30
Certificate 16

Human Resources Management

Associate in Science 31
Certificate 16

Industrial Management

Associate in Science 32

Industrial Technology

Bachelor of Science 33

Management

Bachelor of Science in Business
Administration 34

Management Information Systems

Associate in Science 36
Bachelor of Science in Business
Administration 37

Marketing

Associate in Science 39
Certificate 16

Materials Management

Certificate 17

Operations Management

Certificate 17

Purchasing

Associate in Science 40
Certificate 18

Real Estate

Associate in Science 41
Certificate 18

Transportation and Physical Distribution Management

Associate in Science 42
Certificate 20

Health Professions and Sciences

Chemical-Biological Technology

Associate in Science 46
Bachelor of Science 47

Health Management

Bachelor of Science 48
Option in Community Health Management 49
Option in Long-Term Care Administration 49

Health Record Administration

Bachelor of Science 50

Certificate 50

Health Science

Bachelor of Science in Health Science 53

Medical Laboratory Science

Associate in Science 56

Medical Technology, Bachelor of Science 56

Hematology, Bachelor of Science 59

Nursing

Bachelor of Science in Nursing (in affiliation with the College of Nursing) 61

Radiologic (X-Ray) Technology

Associate in Science 63

Therapeutic Recreation Services

Associate in Science 65

Certificate 65

Law Enforcement

Correctional Practices

Associate in Science 70

Bachelor of Science 72

Law Enforcement

Associate in Science 74

Bachelor of Science 76

Security

Associate in Science 78

Bachelor of Science 80

Liberal Arts

Advertising and Public Relations

Certificate 12

American Sign Language and Deaf Studies

Certificate 12

American Studies

Certificate 13

Arts and Sciences

Associate in Science 86

Economics

Bachelor of Arts 86

Bachelor of Science 87

English

Bachelor of Arts 88

Bachelor of Science 89

Fine Arts

Bachelor of Arts 90

Bachelor of Science 90

Gerontology

Certificate 15

Graphic Design and Visual Communication

Associate in Science 91

Bachelor of Science 92

Certificate 15

History

Bachelor of Arts 93

Bachelor of Science 94

Liberal Studies

Bachelor of Arts in Liberal Studies 96

Music

Bachelor of Arts 98

Bachelor of Science 99

Political Science

Bachelor of Arts 100

Bachelor of Science 102

Psychology

Bachelor of Arts 105

Bachelor of Science 106

Public Administration

Certificate 17

Sign Language Interpreting

Certificate 18

Sociology-Anthropology

Bachelor of Arts 107

Bachelor of Science 108

Software Technical Writing

Certificate 19

Song Writing

Certificate 19

Speech Communication

Certificate 20

Technical Communications

Bachelor of Science 110

Writing

Certificate 20

Course descriptions are listed in alphabetical order beginning on page 118.

Certificate Programs

Many persons who enroll in University College are seeking specific, job-related skills rather than the traditional course sequence of a degree program. To help meet such needs, University College offers a variety of certificate programs designed for:

- students who plan to complete an associate's degree but who first want to acquire the marketable skills offered in a certificate program
- individuals who seek an intensive course of study in a discipline but who do not wish to acquire a degree
- individuals who already hold a degree but who wish to acquire a specialized body of knowledge for a career change or professional development

Students may enroll in courses leading to a certificate at any time; it is not necessary to submit an application. After all of the courses in the certificate program are completed, students must submit a petition requesting a certificate to the Office of Academic and Student Affairs. Petitions are available at all campus locations or by calling 617-437-2400.

For assistance in determining course prerequisites or in deciding on the appropriate program, call 617-437-2400 and make an appointment to speak with an academic advisor or call the number listed with the individual certificate program.

Most certificate programs are designed so that transfer into a related degree program is possible. In addition, a limited amount of transfer credit for introductory courses taken at another school may be applied toward certificate program requirements, except for the American Sign Language and Deaf Studies and Sign Language Interpreting certificates. The number of transfer credits permitted varies by certificate.

An individual may be awarded only two certificates. Students who choose to complete a sec-

ond certificate in a subject that is related to the first often find that the two have certain courses in common. However, a second certificate will not be awarded if more than 50 percent of the course work is duplicated.

On occasion, students have good reasons for requesting permission to replace a required course with a substitute course. Permission to substitute a course must be granted by the appropriate program office. Students should submit a completed Petition for Course Substitution and Waivers to the appropriate office. Petitions are available at all campus locations.

All course credits used to fulfill the requirements for a certificate program must reflect academic work completed within five years prior to the date on which the certificate is awarded.

Accounting Certificate Program

				quarter hours
ACC 4101	ACC 4102	ACC 4103	Accounting Principles I, 2, 3	9
ACC 4301	ACC 4302	ACC 4303	Intermediate Accounting I, 2, 3	9
ACC 4310			Cost Accounting I	3
FI 4301			Principles of Finance	3

Total Quarter Hours (Possible transfer credit: 9 quarter hours) **24**

For more information, call 617-437-2418.

Advertising and Public Relations Certificate Program

			quarter hours
JRN 4349		Advertising Basics	3
JRN 4112		Fundamentals of Newswriting	3
JRN 4335		Public Relations Basics	3
JRN 4336		Public Relations Practices	3
JRN 4337		Public Relations Problems	3
MKT 4301		Introduction to Marketing I	3
SPC 4251		Business and Professional Speaking	3
ART 4143		Advertising Design	3
ART 4366		Promotional and Technical Publications: Design and Production	3

Total Quarter Hours (Possible transfer credit: 9 quarter hours) **27**

For more information, call 617-437-2416.

American Sign Language and Deaf Studies Certificate Program

			quarter hours
ASL 4101	ASL 4102	American Sign Language I, 2*	8
ASL 4201	ASL 4202	Intermediate American Sign Language I, 2	8
ASL 4301	ASL 4302	Advanced American Sign Language Proficiency I, 2	8
ASL 4402		American Deaf Culture	3
ASL 4404		Linguistics of American Sign Language	3
ASL 4401		Deaf History	(3)
or		or	
ASL 4403		American Sign Language Literature	(3)

Total Quarter Hours (Possible transfer credit for ASL 4101 and ASL 4102: 8 quarter hours; all other credits must be completed in residence) **33**

*An Advanced Placement examination is available for this course.

For more information, call 617-437-3064 (voice) or 617-437-3067 (TTY).

American Studies Certificate Program

		quarter hours
HST 4201	American History 1763-1848	3
HST 4202	American History 1848-1917	3
HST 4203	American History since 1917	3
POL 4104	Introduction to American Government	3
SOA 4430	Native North American Peoples	3
ENG 4234	Modern American Voices: The New Essayist	3
ENG 4611	The American Novel	3
ART 4223	American Architecture	3
MUS 4138	American Musical Theatre	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)		27

For more information, call 617-437-2416.

Compensation and Benefits Management Certificate Program

			quarter hours
HRM 4310	HRM 4311	Personnel Management I, 2*	6
HRM 4321	Wage and Salary Administration		3
HRM 4322	Employee Benefits		3
HRM 4323	Job Evaluation		3
HRM 4330	HRM 4331	Employment Rights I, 2*	6
Elective in Human Resources Management			3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			24

*This certificate may be taken by students who have also completed the Human Resources Management certificate. Asterisked courses would not have to be repeated.

For more information, call 617-437-2418.

Computer Programming and Systems Analysis Certificate Program

			quarter hours
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems I, 2	6
MIS 4221	MIS 4222	MIS 4223	COBOL Programming I, 2, 3
MIS 4230	End User Software		3
MIS 4241	MIS 4242	Programming in BASIC I, 2	6
MIS 4301	MIS 4302	Structured Systems Analysis and Design I, 2	6
Total Quarter Hours (Possible transfer credit: 12 quarter hours)			30

This certificate differs from the Computer Systems Specialist Program (described below) in that the courses for this certificate are regularly offered at all campuses and may be completed over a longer period of time than in the Specialist Program. For more information about both programs, call 617-437-2418.

Computer Systems Specialist Program

The Program

The Computer Systems Specialist Program is designed to offer students an opportunity to acquire training as computer systems specialists. Intended for students who are interested in entry-level programming positions in business and industry, the program is structured to help meet the career goals of individuals who presently have little or no academic or work-related background in computer programming. Students who successfully complete the program receive a Computer Systems Specialist certificate.

Admission

College Board Examinations are not required for admission. For purposes of evaluation for admission, however, a computer-programmer aptitude test is administered to applicants who successfully complete the initial screening process. Enrollment is limited. This program is offered only if a sufficient number of qualified candidates apply.

Time and Place

The program is scheduled twice during the academic year, in the fall and spring quarters. Classes are scheduled for 30 weekends: on

Friday, from 6 to 10 p.m., and all day Saturday, from 9 a.m. to 5:30 p.m. Sections offered alternate among the Boston, Burlington, and Dedham campuses.

Academic Credit and Certification

Upon satisfactory completion of the program, students will have accumulated 45 quarter hours of academic credit. These credits represent 26 percent of the credits necessary for a bachelor's degree. Students satisfactorily completing the program also receive a Computer Systems Specialist certificate.

Placement Assistance

Although job placement is not guaranteed, most students who successfully complete the program find suitable employment. Specific placement services include individual counseling; job-search seminars on career opportunities, self-assessment, résumé preparation, and interviewing skills; and résumé referrals to employers.

For More Information

For more information about the program and an application form, contact the Business Administration Programs Office, Northeastern University, University College, 360 Huntington Avenue, Boston, MA 02115, telephone 617-437-2418.

Course Content

Courses include the following:

				quarter hours
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems I, 2	6
MGT 4101	MGT 4102		Introduction to Business and Management I, 2	6
MIS 4221	MIS 4222	MIS 4223	COBOL Programming I, 2, 3	9
MIS 4235		Advanced COBOL Programming		3
MIS 4230		End User Software		3
MIS 4241	MIS 4242		Programming in BASIC I, 2	6
MIS 4273		PC DOS and Assembler		3
MIS 4301	MIS 4302		Structured Systems Analysis and Design I, 2	6
MIS 4345		Data-Base Management Systems		3
Total Quarter Hours				45

Finance Certificate Program

				quarter hours
ACC 4101	ACC 4102	ACC 4103	Accounting Principles I, 2, 3	9
FI 4301			Principles of Finance	3
FI 4302			Financial Management	3
FI 4310			Investment Principles	3
FI 4320			Credit Principles	3
FI 4325			Budgeting and Planning	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)				24

For more information, call 617-437-2418.

Gerontology Certificate Program

				quarter hours
SOC 4225			Social Gerontology	3
PSY 4242			Development: Adulthood and Aging	3
SOC 4226			Work, Leisure, and Aging	3
PSY 4243			Aging and Mental Health	3
ECN 4312			Economic Concerns of Older Adults	3
PHL 4220			Meaning of Death	3
POL 4375			Consumer Advocacy I	3
SOC 4240			Sociology of Human Service Organizations	3
HSC 4610			Geriatric Nutrition	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)				27

For more information, call 617-437-2416.

Graphic Design and Visual Communication Certificate Program

				quarter hours
ART 4140			Graphic Communication and Production	3
JRN 4349			Advertising Basics	3
ART 4150			Graphic Design: Tools and Techniques	3
ART 4151			Typography	3
ART 4141	ART 4142		Graphic Design I, 2	6
ART 4143			Advertising Design	3
ART 4366			Promotional and Technical Publications: Design and Production	3
ART 4251			Advanced Graphic Design	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)				27

For more information, call 617-437-2416.

Hotel and Restaurant Management Certificate Program

			quarter hours
HTL 4301		Introduction to Hotel and Restaurant Management	3
HTL 4303		Front Office Management	(3)
or		or	
HTL 4308		Food and Beverage Cost Control	(3)
HTL 4305	HTL 4306	Food Preparation I, 2	6
ACC 4101	ACC 4102	Accounting Principles I, 2	6
HTL 4309		Managerial Accounting for the Hospitality Industry	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			21

For more information, call 617-437-2418.

Human Resources Management Certificate Program

			quarter hours
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
HRM 4303		Applied Human Resources Management	3
HRM 4310	HRM 4311	Personnel Management I, 2	6
HRM 4330	HRM 4331	Employment Rights I, 2	6
HRM 4340		Public Sector Collective Bargaining in the United States	(3)
or		or	
HRM 4341		Private Sector Collective Bargaining in the United States	(3)
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			24

For more information, call 617-437-2418.

Marketing Certificate Program

			quarter hours
MKT 4301	MKT 4302	Introduction to Marketing I, 2	6
MKT 4310	MKT 4311	Advertising and Sales Promotion Management I, 2	6
MKT 4315	MKT 4316	Sales Management I, 2	6
MKT 4320	MKT 4321	Marketing Management I, 2	6
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			24

For more information, call 617-437-2418.

Materials Management Certificate Program

			quarter hours
ACC 4101	ACC 4102	Accounting Principles I, 2	6
PUR 4351	PUR 4352	Purchasing I, 2	6
PUR 4358		Materials Requirement Planning	3
PUR 4370		Inventory Management	3
PUR 4365		Production Activity Control	3
TRN 4305		Traffic Management I	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			24

For more information, call 617-437-2418.

Operations Management Certificate Program

			quarter hours
IM 4310		Manufacturing Processes	3
IM 4311		Methods Analysis, Motion and Time Study	3
IM 4312		Issues in Operations Management	3
IM 4313		Cases in Industrial Management	3
IM 4315		Industrial Decision Making I	3
IM 4317		Materials Management	3
IM 4320		Managing for Results	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			21

For more information, call 617-437-2418.

Public Administration Certificate Program

			quarter hours
POL 4104		Introduction to American Government	3
POL 4300	POL 4301	Public Administration I, 2	6
POL 4303		Public Personnel Administration	3
POL 4304		Public Budgeting	3
POL 4305		Organizational Theory	3
POL 4306		Public Policy Analysis	3
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems I, 2	6
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			27

For more information, call 617-437-2416.

Purchasing Certificate Program

			quarter hours
PUR 4351	PUR 4352	Purchasing 1, 2	6
PUR 4357		Business Negotiations	3
PUR 4358		Materials Requirement Planning	3
ACC 4101	ACC 4102	Accounting Principles 1, 2	6
MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
IM 4314		Production Control and Inventory Management 1	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			27

For more information, call 617-437-2418.

Real Estate Certificate Program

			quarter hours
RE 4301	RE 4302	Real Estate Fundamentals 1, 2	6
RE 4323	RE 4324	Real Estate Appraisal 1, 2	6
RE 4328	RE 4329	Real Estate Financial Analysis 1, 2	6
RE 4341	RE 4342	Real Estate Law 1, 2	6
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			24

For more information, call 617-437-2418.

Sign Language Interpreting Certificate Program

				quarter hours
ASL 4600			Introduction to Interpreting	3
ASL 4601	ASL 4602	ASL 4603	American Sign Language Interpreting 1, 2, 3	12
ASL 4604	ASL 4605	Special Topics in Interpreting 1, 2		6
ASL 4606			Interpreter Roles and Ethics	3
ASL 4607			Interpreting Lab	4
ASL 4608			Practicum	4
Total Quarter Hours (Possible transfer credit: 8 quarter hours)				32

Advanced placement examinations are available for ASL 4202, ASL 4302, ASL 4402, and ASL 4404, which are prerequisites for courses for this certificate.

For more information, call 617-437-3064 (voice) or 617-437-3067 (TTY).

Software Technical Writing Certificate Program

				quarter hours
ART 4140			Graphic Communication and Production	3
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems I, 2	6
TCC 4101	TCC 4102		Technical Writing I, 2	6
TCC 4105			Editing for Science and Technology	3
TCC 4301	TCC 4302		Computer Software Technical Writing I, 2	6
<i>Choose one computer language from the following:</i>				
MIS 4220			Introduction to Programming in COBOL	(3)
or			or	
MIS 4240			Introduction to Programming in BASIC	(3)
or			or	
MIS 4250			FORTRAN Programming I	(3)
or			or	
MIS 4270			PASCAL Programming I	(3)
Total Quarter Hours (Possible transfer credit: 9 quarter hours)				27

For more information, call 617-437-2416.

Song Writing Certificate Program

				quarter hours
ENG 4357			Creative Writing: Poetry	3
MUS 4110			Music in Popular Culture	(3)
or			or	
MUS 4165			The Music Industry	(3)
MUS 4201	MUS 4202	MUS 4203	Music Theory I, 2, 3	12
MUS 4241			Piano Class I	(3)
or			or	
MUS 4247			Guitar Class I	(3)
MUS 4254	MUS 4255	MUS 4256	Music Tutorial in Song Writing/Arranging I, 2, 3	9
Total Quarter Hours (Possible transfer credit: 9 quarter hours)				30

For more information, call 617-437-2416.

Speech Communication Certificate Program

		quarter hours
SPC 4101	Fundamentals of Human Communication	3
SPC 4102	Group Discussion	3
SPC 4150	Self-Concept and Communication	3
SPC 4111	Voice and Articulation I	3
SPC 4151	Listening	3
SPC 4152	Interviewing	3
SPC 4153	Techniques of Persuasion	3
SPC 4154	Negotiation Skills	3
SPC 4251	Business and Professional Speaking	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)		27

For more information, call 617-437-2416.

Transportation and Physical Distribution Management Certificate Program

			quarter hours
TRN 4301	Elements of Transportation		3
TRN 4302	Physical Distribution Management		3
TRN 4305	Traffic Management I		3
TRN 4316	Carrier Management		3
TRN 4321	Transportation Regulation I		3
MGT 4101	MGT 4102	Introduction to Business and Management I, 2	6
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			21

For more information, call 617-437-2418.

Writing Certificate Program

			quarter hours
ENG 4349	ENG 4350	Expository and Persuasive Writing I, 2	6
ENG 4352		Expository Communications	3
JRN 4112		Fundamentals of Newswriting	3
JRN 4113		Newsgathering and Reporting	3
TCC 4101	TCC 4102	Technical Writing I, 2	6
ENG 4356		Creative Writing	3
ENG 4363		Writing for the Marketplace	3
Total Quarter Hours (Possible transfer credit: 9 quarter hours)			27

For more information, call 617-437-2416.

Business Administration Degree Programs

270 Ruggles Building
617-437-2418

Purpose

University College recognizes that adult students seek educational opportunities in business to satisfy many different professional needs. To help meet these needs, the College offers a wide selection of business and business-related courses as well as structured academic programs. Among the available options are certificate programs, associate's degree programs, and bachelor's degree programs. All certificate and degree programs have the common objective of offering students an opportunity to achieve professional competence in a formal set of business subjects while laying the foundation for further professional growth.

Programs

Certificates in Business

University College offers certificate programs for individuals seeking to build or advance a marketable specialization in business. Professional areas covered by the certificate programs include accounting, compensation and benefits management, computer programming and systems analysis, finance, hotel and restaurant management, human resources management, marketing, materials management, operations management, purchasing, real estate, and transportation and physical distribution management. Detailed infor-

mation on these programs, together with a recommended course sequence for completing them, appears in the section on certificate programs, pages 12-20.

Associate in Science Degrees

Programs leading to the Associate in Science degree are offered in accounting, business administration, finance, hotel and restaurant management, human resources management, industrial management, management information systems, marketing, purchasing, real estate, and transportation and physical distribution management.

These programs provide breadth of perspective through exposure to a well-balanced sequence of liberal arts courses. Specialized knowledge for future managerial growth may be acquired through the study of a core of professional business courses and a major or concentration in a business discipline. Students who have completed a certificate program may then enroll in an associate's degree program. Although credits earned in a certificate program may be applied toward this degree, completion of a certificate program is not required for the associate's degree. To be awarded the associate's degree, a student must successfully complete the 96 quarter hours of course credit detailed on the following pages.

Bachelor of Science in Business Administration Degrees

The Bachelor of Science in Business Administration (BSBA) degree is offered in accounting, management, and management information systems. Students who have decided to pursue a bachelor's degree in business should enroll in the courses detailed on page 24 prior to applying for admission to the Bachelor of Science in Business Administration degree program. These courses provide the broad educational foundation needed for the professional-level courses in business administration.

Students who wish to earn one of the Associate in Science degrees in business before entering a BSBA degree program should note that these programs include a validation requirement

for upper-level business courses taken while pursuing the associate's degree. (See details below.)

Admission to a BSBA degree program is restricted to students who have maintained a 2.0 cumulative grade-point average and completed a minimum of 80 quarter hours (60 semester hours) of credit, including certain basic courses in required subjects, either in University College or at another accredited institution. There is a special application form for admission to this program.

The BSBA degree program conforms to all standards established by the American Assembly of Collegiate Schools of Business (AACSB), which has been recognized by the Council for Post-Secondary Accreditation and by the United States Office of Education as the sole accrediting organization for university bachelor's and master's degree programs in business administration. Although there are more than 2,000 college and university programs in the United States, fewer than 10 percent of these institutions offer business programs that are fully accredited by AACSB. Northeastern University is unique in the New England region in that both its full-time and part-time bachelor's degree business programs are accredited.

Validation Requirement

"Validation" is the term used to describe a set of procedures that tests whether an upper-level course completed at the lower division of a bachelor's program should be accepted for transfer credit in the upper division of an AACSB-approved bachelor's degree program. There are three approved validation methods:

- 1 **Sequential Course.** Students who enroll in a Bachelor of Science in Business Administration degree program can validate a course taken at University College or elsewhere by successfully completing a course that is sequential to the course already completed. The sequential course must be taken in a reserved section. For example, successful completion of *Cost Accounting 2* in a reserved section can validate *Cost Accounting 1*, regardless of where the student completed *Cost Accounting 1*.

- 2 **College-Level Examination Program (CLEP) and/or Proficiency Examination Program (PEP).**

These standard examinations can be used to validate some previously taken upper-level business courses.

- 3 **Departmental Examination.** In cases where a sequential course does not exist or is not desired by a student, and no appropriate CLEP or PEP examination exists, validation can be accomplished through a departmental examination. Required upper-level courses are listed below under "Reserved and Open Sections."

Reserved and Open Sections

University College business courses required for a Bachelor of Science in Business Administration degree are classified as either *reserved* or *open*. Eligibility to register for reserved sections depends on the total number of course credits (including transfer credits) that a student has accumulated. A reserved section of a course is restricted to students who have accumulated 80 or more course credits. *Reserved sections of certain business courses are mandatory for students who have enrolled in one of the Bachelor of Science in Business Administration degree programs.* Reserved section courses are offered at the Boston, Burlington, Dedham, Framingham, and Weymouth campuses.

An open section of a course is one in which students may register without any restrictions.

The courses below are offered only in reserved sections. A schedule of the reserved sections offered for the 1986-87 fall, winter, and spring quarters is included in the *Fall 1986 Schedule Guide*.

ACC 4304		Intermediate Accounting 4
ACC 4311		Cost Accounting 2
ACC 4325		Auditing 1
ACC 4330		Internal Auditing 1
ACC 4340	ACC 4341	Federal Income Taxes 1, 2
MGT 4310		Project Management Process
MGT 4350	MGT 4351	Business Policy 1, 2
MGT 4355		Manager and Society
MGT 4356		International Business Management and Operations
MGT 4360	MGT 4361	Management Seminar 1, 2
MIS 4345		Data-Base Management Systems
MIS 4348		Information Resource Management
MIS 4385		Applied MIS Development Project

The following upper-level courses are offered in both open and reserved sections. Students already enrolled in the BSBA program who did not take these courses in their associate's degree programs must take them in reserved sections.

ACC 4301	ACC 4302	ACC 4303	Intermediate Accounting 1, 2, 3
ACC 4310			Cost Accounting 1
FI 4301			Principles of Finance
FI 4302			Financial Management
HRM 4301			Organizational Behavior
HRM 4302			Introduction to Human Resources Management
HRM 4303			Applied Human Resources Management
IM 4301			Operations Management (formerly Production Management)
MIS 4301	MIS 4302		Structured Systems Analysis and Design 1, 2
MIS 4307			Communications and Networking
MKT 4301			Introduction to Marketing 1
MKT 4320			Marketing Management 1

Planning a Program of Study

Students who plan to work toward the Bachelor of Science in Business Administration degree should submit transcripts of previously completed college-level course work and a Transfer Credit Petition to the Office of Academic and Student Affairs. (Transfer Credit Petitions may be requested by calling 617-437-2400. They are also available at all campus locations.) Students will receive by mail a transfer credit evaluation and a suggested plan of study to prepare for admission to this program. When this paperwork has been completed, students are encouraged to schedule an appointment with an academic advisor to discuss their programs.

Students who do not have any academic courses that may be transferred from another educational institution or program should plan to

meet with an academic advisor early in their studies at University College. These students are required to complete 80 quarter hours of credit, including English courses ENG 4110, 4111, and 4112; mathematics courses MTH 4110 and 4111; and a social science elective from the group of courses listed at the end of this section. This course work must be completed prior to admission to the BSBA degree program. Upon completion of these requirements, students should complete a Petition for Admission to the Bachelor of Science in Business Administration degree program and return it to the Office of Academic and Student Affairs to initiate the admissions process. This petition may be obtained at all campus locations or by calling 617-437-2400.

Students should choose their 80 quarter hours of credit from the list of recommended lower-level courses below.

Recommended Lower-Level Courses

ACC 4101	ACC 4102	ACC 4103	Accounting Principles 1, 2, 3
BL 4101	BL 4102		Law 1, 2
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3
ECN 4250	ECN 4251		Statistics 1, 2
ENG 4110	ENG 4111		Critical Writing 1, 2
ENG 4112			Approaches to Literature
ENG 4380	ENG 4381		Business Writing and Reports 1, 2
MGT 4101	MGT 4102	MGT 4103	Introduction to Business and Management 1, 2, 3
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems 1, 2
MS 4325			Introduction to Modeling and Simulation
MTH 4110	MTH 4111		Mathematics 1, 2
PSY 4110			Fundamental Issues in Psychology
PSY 4111			Developmental Aspects in Psychology
PSY 4112			Personal Dynamics in Psychology
SOC 4100			Fundamental Issues in Sociology
SOC 4101			The Individual and Social Roles
or			or
SOC 4102			Critical Issues Facing Society
SPC 4101			Fundamentals of Human Communication

6 quarter hours of nonbusiness electives

3 quarter hours of a natural science elective

Program Consultants

ACC: Accounting

Consultant: Prof. Paul A. Janell (437-4645)

Associate Consultant (Accounting Principles):

Dean Walter E. Kearney, Jr. (437-2312)

BL: Business Law

Consultant: Thomas J. Ahern, Esq. (426-4211)

FI: Finance

Consultant: Prof. Jonathan Welch (437-4572)

Associate Consultant: Joseph Stanford (383-9299)

HTL: Hotel and Restaurant Management

Consultant: Donald A. Witkoski (362-2131, x361)

HRM: Human Resources Management

Consultant: Prof. Christine L. Hobart (437-4728)

Associate Consultant: Ronald E. Guittarr

(860-2774)

Associate Consultant: Daniel F. Hurley (785-0484)

IM: Industrial Management

Consultant: Prof. Robert A. Parsons (437-4749)

Consultant: Joel M. Rosenfeld (491-9200)

Associate Consultant: James D. Mukjian

(451-4004)

MGT: Management

Consultant: Prof. Daniel McCarthy (437-3255)

Associate Consultant: W. Arthur Gagne

(263-5819)

Associate Consultant: Robert L. Goldberg

(421-2602)

MIS: Management Information Systems

Consultant: Prof. Victor Godin (437-2418)

Associate Consultant (Systems): James F. Ferreira

(969-3100)

Associate Consultant (EDP): Thomas M. Kelly

(726-2275)

Associate Consultant (Programming):

Andrew E. Efstathiou (727-6524)

Associate Consultant (Programming):

Bennett L. Kramer (588-9100, x208)

MKT: Marketing

Consultant: Prof. Dan T. Dunn, Jr. (437-4563)

Associate Consultant: William T. Hadley

(236-8532)

MS: Quality Control and Management Sciences

Consultant: Prof. Robert A. Parsons (437-4749)

Associate Consultant: Cephas Rogers (493-6972)

PUR: Purchasing

Consultant: Stephen F. Armstrong

(281-2000, x2519)

RE: Real Estate

Consultant: Leo M. Flynn (927-3406)

TRN: Transportation and Physical Distribution Management

Consultant: Prof. James F. Molloy (437-4812)

Accounting Associate in Science Degree (Major Code 470)**Core Courses****Liberal Arts**

quarter hours

ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics 1, 2	6
ECN 4250	ECN 4251		Statistics 1, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	(3)
or			or	
PSY 4112			Personal Dynamics in Psychology	(3)

Business Administration

BL 4101	BL 4102	Law I, 2	6
MS 4325		Introduction to Modeling and Simulation	3
FI 4301		Principles of Finance	3
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
MGT 4101	MGT 4102	Introduction to Business and Management I, 2	6
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems I, 2	6
MKT 4301		Introduction to Marketing I	3

Choose one computer programming course from:

MIS 4220		Introduction to Programming in COBOL	(3)
or		or	
MIS 4240		Introduction to Programming in BASIC	(3)
or		or	
MIS 4250		FORTRAN Programming I	(3)

Major Concentration Courses

ACC 4101	ACC 4102	ACC 4103	Accounting Principles I, 2, 3	9
ACC 4301	ACC 4302	ACC 4303	Intermediate Accounting I, 2, 3	9
ACC 4310			Cost Accounting I	3

Nonbusiness Electives

3

Total Quarter Hours**96**

Accounting

Bachelor of Science in Business Administration Degree (Major Code 460)

Core Courses

Liberal Arts			quarter hours	
ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
MTH 4110	MTH 4111	Mathematics 1, 2	6	
ECN 4250	ECN 4251	Statistics 1, 2	6	
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PSY 4110		Fundamental Issues in Psychology	3	
PSY 4111		Developmental Aspects in Psychology	(3)	
or		or		
PSY 4112		Personal Dynamics in Psychology	(3)	
ENG 4380	ENG 4381	Business Writing and Reports 1, 2	6	
SOC 4100		Fundamental Issues in Sociology	3	
SOC 4101		The Individual and Social Roles	(3)	
or		or		
SOC 4102		Critical Issues Facing Society	(3)	
SPC 4101		Fundamentals of Human Communication	3	

Business Administration

BL 4101	BL 4102	Law 1, 2	6
MS 4325		Introduction to Modeling and Simulation	3
FI 4301		Principles of Finance	3
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
MKT 4301		Introduction to Marketing I	3
FI 4302		Financial Management	3
IM 4301		Operations Management	3
MGT 4350	MGT 4351	Business Policy 1, 2	6
MGT 4356		International Business Management and Operations	3

Choose one computer programming course from:

MIS 4220		Introduction to Programming in COBOL	(3)
or		or	
MIS 4240		Introduction to Programming in BASIC	(3)
or		or	
MIS 4250		FORTTRAN Programming I	(3)

Continued

Major Concentration Courses

ACC 4101	ACC 4102	ACC 4103	Accounting Principles I, 2, 3	9
ACC 4301 ACC 4304	ACC 4302	ACC 4303	Intermediate Accounting I, 2, 3, 4	12
ACC 4310	ACC 4311		Cost Accounting I, 2	6
ACC 4325 or ACC 4330			Auditing I or Internal Auditing I	(3) (3)
ACC 4340	ACC 4341		Federal Income Taxes I, 2	6

Electives

Natural Science Elective (BIO, CHM, or ESC)	3
Nonbusiness Electives	6
Open Electives	27

Total Quarter Hours**174****Business Administration Associate in Science Degree (Major Code 401)****Core Courses**

Liberal Arts			quarter hours	
ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
MTH 4110	MTH 4111	Mathematics 1, 2	6	
ECN 4250	ECN 4251	Statistics 1, 2	6	
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PSY 4110		Fundamental Issues in Psychology	3	
PSY 4111		Developmental Aspects in Psychology	(3)	
or		or		
PSY 4112		Personal Dynamics in Psychology	(3)	

Business Administration

MGT 4101	MGT 4102	MGT 4103	Introduction to Business and Management I, 2, 3	9
ACC 4101	ACC 4102	ACC 4103	Accounting Principles I, 2, 3	9
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems I, 2	6
MS 4325			Introduction to Modeling and Simulation	3
HRM 4301			Organizational Behavior	3
HRM 4302			Introduction to Human Resources Management	3
HRM 4303			Applied Human Resources Management	3
FI 4301			Principles of Finance	3
MKT 4301			Introduction to Marketing I	3

Electives

Nonbusiness Electives	6
Open Electives	12

Total Quarter Hours**96**

Finance Associate in Science Degree (Major Code 476)

Core Courses

Liberal Arts

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
MTH 4110	MTH 4111	Mathematics 1, 2	6	
ECN 4250	ECN 4251	Statistics 1, 2	6	
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PSY 4110		Fundamental Issues in Psychology	3	
PSY 4111		Developmental Aspects in Psychology	(3)	
or		or		
PSY 4112		Personal Dynamics in Psychology	(3)	

Business Administration

MGT 4101	MGT 4102		Introduction to Business and Management 1, 2	6
ACC 4101	ACC 4102	ACC 4103	Accounting Principles 1, 2, 3	9
BL 4101	BL 4102		Law 1, 2	6
MS 4325			Introduction to Modeling and Simulation	3
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems 1, 2	6
HRM 4301			Organizational Behavior	3
HRM 4302			Introduction to Human Resources Management	3
MKT 4301			Introduction to Marketing 1	3

Choose one computer programming course from:

MIS 4220		Introduction to Programming in COBOL	(3)
or		or	
MIS 4240		Introduction to Programming in BASIC	(3)
or		or	
MIS 4250		FORTTRAN Programming I	(3)

Major Concentration Courses

FI 4301	Principles of Finance	3
FI 4302	Financial Management	3
FI 4310	Investment Principles	3
FI 4320	Credit Principles	3
FI 4325	Budgeting and Planning	3

Electives

3

Total Quarter Hours

96

Hotel and Restaurant Management Associate in Science Degree (Major Code 472)

Core Courses

Liberal Arts			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
MTH 4110	MTH 4111	Mathematics 1, 2	6
SPC 4101		Fundamentals of Human Communication	3
ECN 4115	ECN 4116	Economic Principles and Problems 1, 2	6
PSY 4110		Fundamental Issues in Psychology	3
PSY 4111		Developmental Aspects in Psychology	(3)
or		or	
PSY 4112		Personal Dynamics in Psychology	(3)

Business Administration

MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
ACC 4101	ACC 4102	Accounting Principles 1, 2	6
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
HRM 4303		Applied Human Resources Management	3

Major Concentration Courses

HTL 4301		Introduction to Hotel and Restaurant Management	3
HTL 4303		Front Office Management	3
HTL 4304		Hotel and Restaurant Law	3
HTL 4307		Food Service Engineering and Sanitation	3
HTL 4308		Food and Beverage Cost Control	3
HTL 4309		Managerial Accounting for the Hospitality Industry	3
HTL 4313		Introduction to Tourism	3
HTL 4320		Food Preparation Intensive	6

Electives	12
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Total Quarter Hours	96
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Human Resources Management Associate in Science Degree (Major Code 477)**Core Courses****Liberal Arts**

quarter hours

ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics 1, 2	6
ECN 4250	ECN 4251		Statistics 1, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	(3)
or			or	
PSY 4112			Personal Dynamics in Psychology	(3)

Business Administration

MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
ACC 4101	ACC 4102	Accounting Principles 1, 2	6
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
MS 4325		Introduction to Modeling and Simulation	3
BL 4101		Law I	3
FI 4301		Principles of Finance	3
MKT 4301		Introduction to Marketing I	3

Choose one computer programming course from:

MIS 4220	Introduction to Programming in COBOL	(3)
or	or	
MIS 4240	Introduction to Programming in BASIC	(3)
or	or	
MIS 4250	FORTRAN Programming I	(3)

Major Concentration Courses

HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
HRM 4303		Applied Human Resources Management	3
HRM 4310	HRM 4311	Personnel Management 1, 2	6
HRM 4330	HRM 4331	Employment Rights 1, 2	6
HRM 4340		Public Sector Collective Bargaining	(3)
or		or	
HRM 4341		Private Sector Collective Bargaining	(3)

Nonbusiness Electives

3

Total Quarter Hours**96**

Industrial Management Associate in Science Degree (Major Code 478)**Core Courses**

Liberal Arts			quarter hours	
ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
MTH 4110	MTH 4111	Mathematics 1, 2	6	
ECN 4250	ECN 4251	Statistics 1, 2	6	
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
MTH 4130	MTH 4131	Calculus for Nonengineers 1, 2	6	
PSY 4110		Fundamental Issues in Psychology	3	
PSY 4111		Developmental Aspects in Psychology	(3)	
or		or		
PSY 4112		Personal Dynamics in Psychology	(3)	

Business Administration

MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
ACC 4101	ACC 4102	Accounting Principles 1, 2,	6
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
MS 4325		Introduction to Modeling and Simulation	3
IM 4301		Operations Management	3
FI 4301		Principles of Finance	3
<i>Choose one computer programming course from:</i>			
MIS 4220		Introduction to Programming in COBOL	(3)
or		or	
MIS 4240		Introduction to Programming in BASIC	(3)
or		or	
MIS 4250		FORTTRAN Programming I	(3)

Major Concentration Courses

IM 4310	Manufacturing Processes	3
IM 4311	Methods Analysis, Motion and Time Study	3
IM 4312	Issues in Operations Management	3
IM 4313	Cases in Industrial Management	3
IM 4315	Industrial Decision Making I	3
IM 4317	Materials Management	3
IM 4320	Managing for Results	3

Electives

3

Total Quarter Hours**96**

Industrial Technology Bachelor of Science Degree (Major Code 490)

quarter hours

Engineering or Technology Courses

(Must also include English courses ENG 4110, 4111, 4112, or the equivalent)

96

Core Courses**Liberal Arts**

ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	(3)
or			or	
PSY 4112			Personal Dynamics in Psychology	(3)
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	(3)
or			or	
SOC 4102			Critical Issues Facing Society	(3)

Business Administration

MGT 4101	MGT 4102		Introduction to Business and Management 1, 2	6
ACC 4101	ACC 4102		Accounting Principles 1, 2,	6
BL 4101	BL 4102		Law 1, 2	6
HRM 4301			Organizational Behavior	3
HRM 4302			Introduction to Human Resources Management	3
HRM 4303			Applied Human Resources Management	3
MIS 4101			Introduction to Data Processing and Information Systems I	3
MKT 4301			Introduction to Marketing I	3
MGT 4310			Project Management Process: Planning and Implementation	3

Choose three of the following:

IM 4312			Issues in Operations Management	(3)
IM 4313			Cases in Industrial Management	(3)
IM 4320			Managing for Results	(3)
MS 4336			Industrial Experimentation	(3)
MS 4337			Principles of Quality Assurance	(3)

Nonbusiness Electives

12

Total Quarter Hours**174**

Management Bachelor of Science in Business Administration Degree (Major Code 463)

Core Courses

Liberal Arts				quarter hours
ENG 4110	ENG 4111		Critical Writing I, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics I, 2	6
ECN 4250	ECN 4251		Statistics I, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems I, 2, 3	9
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	(3)
or			or	
PSY 4112			Personal Dynamics in Psychology	(3)
ENG 4380	ENG 4381		Business Writing and Reports I, 2	6
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	(3)
or			or	
SOC 4102			Critical Issues Facing Society	(3)
SPC 4101			Fundamentals of Human Communication	3

Business Administration

ACC 4101	ACC 4102	ACC 4103	Accounting Principles I, 2, 3	9
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems I, 2	6
MS 4325			Introduction to Modeling and Simulation	3
HRM 4301			Organizational Behavior	3
HRM 4302			Introduction to Human Resources Management	3
HRM 4303			Applied Human Resources Management	3
FI 4301			Principles of Finance	3
MKT 4301			Introduction to Marketing I	3
BL 4101	BL 4102		Law I, 2	6
FI 4302			Financial Management	3
IM 4301			Operations Management	3
<i>Choose one computer programming course from:</i>				
MIS 4220			Introduction to Programming in COBOL	(3)
or			or	
MIS 4240			Introduction to Programming in BASIC	(3)
or			or	
MIS 4250			FORTRAN Programming I	(3)

Continued

Major Concentration Courses

MGT 4101	MGT 4102	MGT 4103	Introduction to Business and Management 1, 2, 3	9
MGT 4310			Project Management Process: Planning and Implementation	3
MGT 4350	MGT 4351		Business Policy 1, 2	6
MGT 4355			Manager and Society	3
MGT 4356			International Business Management and Operations	3
MGT 4360	MGT 4361		Management Seminar 1, 2	6
MKT 4320			Marketing Management I	3

Electives

Natural Science Elective (BIO, CHM, or ESC)	3
Nonbusiness Electives	6
Open Electives	33

Total Quarter Hours	174
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Management Information Systems Associate in Science Degree (Major Code 475)

Core Courses

Liberal Arts			quarter hours	
ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
MTH 4110	MTH 4111	Mathematics 1, 2	6	
ECN 4250	ECN 4251	Statistics 1, 2	6	
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
SPC 4101		Fundamentals of Human Communication	3	

Business Administration

ACC 4101	ACC 4102	Accounting Principles 1, 2	6
MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
MS 4325		Introduction to Modeling and Simulation	3
FI 4301		Principles of Finance	3
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
HRM 4303		Applied Human Resources Management	3
IM 4301		Operations Management	3

Major Concentration Courses

MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
MIS 4221	MIS 4222	COBOL Programming 1, 2	6
MIS 4230		End User Software	3
MIS 4301	MIS 4302	Structured Systems Analysis and Design 1, 2	6
MIS 4307		Communications and Networking	3

Electives			9
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Total Quarter Hours			96
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Management Information Systems

Bachelor of Science in Business Administration Degree (Major Code 465)

Core Courses

Liberal Arts

quarter hours

ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics 1, 2	6
ECN 4250	ECN 4251		Statistics 1, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
SPC 4101			Fundamentals of Human Communication	3
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	(3)
or			or	
PSY 4112			Personal Dynamics in Psychology	(3)
ENG 4380	ENG 4381		Business Writing and Reports 1, 2	6
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	(3)
or			or	
SOC 4102			Critical Issues Facing Society	(3)

Business Administration

ACC 4101	ACC 4102	ACC 4103	Accounting Principles 1, 2, 3	9
MGT 4101	MGT 4102		Introduction to Business and Management 1, 2	6
MS 4325			Introduction to Modeling and Simulation	3
FI 4301			Principles of Finance	3
HRM 4301			Organizational Behavior	3
HRM 4302			Introduction to Human Resources Management	3
HRM 4303			Applied Human Resources Management	3
IM 4301			Operations Management	3
BL 4101	BL 4102		Law 1, 2	6
FI 4302			Financial Management	3
MKT 4301			Introduction to Marketing 1	3
MGT 4350	MGT 4351		Business Policy 1, 2	6
MGT 4356			International Business Management and Operations	3

Continued

Major Concentration Courses

MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
MIS 4221	MIS 4222	COBOL Programming 1, 2	6
MIS 4230		End User Software	3
MIS 4301	MIS 4302	Structured Systems Analysis and Design 1, 2	6
MIS 4307		Communications and Networking	3
MIS 4345		Data-Base Management Systems	3
MIS 4348		Information Resource Management	3
MIS 4385		Applied MIS Development Project	3
MGT 4310		Project Management Process: Planning and Implementation	3

Electives

Natural Science Elective (BIO, CHM, or ESC)	3
Open Electives	30

Total Quarter Hours	174
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Marketing Associate in Science Degree (Major Code 479)**Core Courses****Liberal Arts**

quarter hours

ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics 1, 2	6
ECN 4250	ECN 4251		Statistics 1, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
ENG 4380			Business Writing and Reports I	3
SPC 4101			Fundamentals of Human Communication	3

Business Administration

MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
ACC 4101	ACC 4102	Accounting Principles 1, 2	6
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
MS 4325		Introduction to Modeling and Simulation	3
FI 4301		Principles of Finance	3

Major Concentration Courses

MKT 4301	MKT 4302	Introduction to Marketing 1, 2	6
MKT 4310	MKT 4311	Advertising and Sales Promotion Management 1, 2	6
MKT 4315	MKT 4316	Sales Management 1, 2	6
MKT 4320	MKT 4321	Marketing Management 1, 2	6

Nonbusiness Electives

6

Total Quarter Hours**96**

Purchasing Associate in Science Degree (Major Code 432)**Core Courses**

Liberal Arts			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
MTH 4110	MTH 4111	Mathematics 1, 2	6
ECN 4250	ECN 4251	Statistics 1, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3
			9

Business Administration

MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
ACC 4101	ACC 4102	Accounting Principles 1, 2	6
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
MS 4325		Introduction to Modeling and Simulation	3
IM 4301		Operations Management	3
MKT 4301		Introduction to Marketing I	3

Major Concentration Courses

PUR 4351	PUR 4352	Purchasing 1, 2	6
PUR 4357		Business Negotiation	3
PUR 4358		Materials Requirement Planning	3
PUR 4459		Subcontract Management	3
IM 4314		Production Control and Inventory Management	3
IM 4317		Materials Management	3

Nonbusiness Electives	12
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Total Quarter Hours	96
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Real Estate Associate in Science Degree (Major Code 471)**Core Courses****Liberal Arts**

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
MTH 4110	MTH 4111	Mathematics 1, 2	6
ECN 4250	ECN 4251	Statistics 1, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3

Business Administration

MGT 4101	MGT 4102	Introduction to Business and Management I, 2	6
ACC 4101	ACC 4102	Accounting Principles I, 2	6
FI 4301		Principles of Finance	3
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3

Major Concentration Courses

RE 4301	RE 4302	Real Estate Fundamentals I, 2	6
RE 4323	RE 4324	Real Estate Appraisal I, 2	6
RE 4328	RE 4329	Real Estate Financial Analysis I, 2	6
RE 4341	RE 4342	Real Estate Law I, 2	6
		Department Offerings	3

Nonbusiness Electives

18

Total Quarter Hours**96**

Transportation and Physical Distribution Management Associate in Science Degree (Major Code 483)

Core Courses

Liberal Arts			quarter hours
ENG 4110	ENG 4111	Critical Writing I, 2	6
ENG 4112		Approaches to Literature	3
MTH 4110	MTH 4111	Mathematics I, 2	6
ECN 4250	ECN 4251	Statistics I, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems I, 2, 3
			9

Business Administration

MGT 4101	MGT 4102	Introduction to Business and Management I, 2	6
ACC 4101	ACC 4102	Accounting Principles I, 2	6
MS 4325		Introduction to Modeling and Simulation	3
FI 4301		Principles of Finance	3
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
IM 4301		Operations Management	3
MKT 4301		Introduction to Marketing I	3

Major Concentration Courses

TRN 4301	Elements of Transportation	3
TRN 4302	Physical Distribution Management	3
TRN 4305	Traffic Management I	3
TRN 4307	Contemporary Issues in Transportation and Distribution	3
TRN 4316	Carrier Management	3
TRN 4321	Transportation Regulation I	3

Nonbusiness Electives	18
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Total Quarter Hours	96
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Health Professions and Sciences Degree Programs

Paula M. Vosburgh, *Director*
Health Professions and Science Programs

Lana B. Melnik, *Assistant to the Director*
Health Professions and Science Programs

266 Ruggles Building
617-437-2818

Purpose

University College offers part-time programs in allied health to help students prepare for advancement and service in hospitals and other health agencies.

Degree programs, both associate's and bachelor's, are designed to provide professional specialization and general educational development. All programs are designed to meet the accreditation standards of the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association (AMA) and of licensing or registration boards where such exist.

Clinical Assignments

Clinical assignments are generally available for students whose programs require directed applied study in a clinical setting. In most instances, lectures are presented at the University and clinical practice is conducted at hospitals or other health agencies in the Greater Boston area. Positions for applied clinical studies are often offered on a competitive basis, with the student's academic performance used as the basis for acceptance.

Students who accept clinical assignments in health facilities are expected to adhere to the requirements of the facilities, which are outside University control.

Preprofessional Medical Courses

The information provided below is for students who plan to apply for admission to schools of medicine, osteopathy, dentistry, podiatry, or optometry. Those who wish to pursue veterinary medicine may need to meet different entrance requirements and should consult the chair of the Health Professions Advisory Committee for additional advice.

Medical School Admission Requirements

The following courses must be completed before one may enroll in medical school and generally should be completed before one takes the school's particular admission test (MCAT, DAT, etc.).

Biology	one year (with labs)
General chemistry	one year (with labs)
Organic chemistry	one year (with labs)
Physics	one year (with labs)
College mathematics	including some calculus
College English	one year

Northeastern University's Health Professions Advisory Committee provides academic advice and help with professional school applications for students in any of the University's health programs. Although advice is available to anyone enrolled in a course, the Committee can prepare evaluation letters only for those who have taken enough course work at Northeastern to be able to have *at least two* Northeastern faculty members write letters to the Committee.

Sources of Advice:

Paula Vosburgh, Director
Health Professions and Science Programs
University College
266 Ruggles Building
617-437-2818

Dr. C. H. Ellis, Jr.
 Chairperson, Health Professions
 Advisory Committee
 Biology Department
 Northeastern University
 445 Richards Hall
 617-437-4032

Professor T. J. McEneaney
 Office of Career Development and Placement
 Northeastern University
 124 Ruggles Building
 617-437-2430

Course Sequences to Meet Minimum Admission Requirements

The following list shows acceptable course sequences that may be taken by students preparing for health professional schools. Completing one sequence from each category should meet the *minimum* requirements of most medical or dental schools. If you have questions about whether other courses might be applicable, talk with Dr. Ellis or another member of the Health Professions Advisory Committee.

General biology	BIO 4103, 4104, 4105—lab <i>must</i> be taken. Other biology work, such as anatomy and physiology and microbiology, may be acceptable, depending on the professional school. General biology is highly recommended even if you have already taken the other courses.
General chemistry	CHM 4111, 4112, 4113—lab <i>must</i> be taken.
Organic chemistry	CHM 4261, 4262, 4263—lab <i>must</i> be taken.
General physics	PHY 4117, 4118, 4119 and labs PHY 4173, 4174.*
Mathematics	MTH 4108, 4120, 4121.
English	ENG 4110, 4111, 4112.

Two additional areas that are often required are behavioral science and biochemistry. Courses that meet these requirements are:

Behavioral science	PSY 4110, 4111, 4112, and/or other psychology courses.
Biochemistry	CHM 4371, 4372, 4373 or BIO 4246, 4247, 4248.

*These courses are scheduled through the School of Engineering Technology. Call 617-437-2500 for more information.

Program Directors and Coordinators

Area program directors and the Director of Health Professions and Science Programs have overall responsibility for the academic quality of the health programs in their areas of specialty. *The program coordinators for each area serve as the chief academic advisors for students in their programs.*

Health Professions

HMG: Health Management

Program Director: Prof. Carl W. Nelson (Health Care Area Coordinator, Graduate School of Business Administration) (437-4751)

Program Coordinator: Office of Health Professions and Science Programs (University College) (437-2818)

HRA: Health Record Administration

Program Director: Prof. Judith Weilerstein (College of Pharmacy and Allied Health Professions) (437-3663)

Program Coordinator: Annalee Collins (College of Pharmacy and Allied Health Professions) (437-2525)

HSC: Health Science

Program Coordinator: Dr. Theodore Blank (Massachusetts Department of Public Health) (727-8614)

MLS: Medical Laboratory Science

Program Director: Prof. Gerald L. Davis (College of Pharmacy and Allied Health Professions) (437-3664)

Clinical Coordinator: Barbara Martin (College of Pharmacy and Allied Health Professions) (437-4198)

Nursing

Academic Coordinator: Marcia DePace (University College) (437-2818)

RAD: Radiologic Technology

Assistant Director: Valerie A. Lamb (University College) (437-2818)

REC: Therapeutic Recreation

Program Director: Prof. Frank Robinson (Boston-Bouvé College of Human Development Professions) (437-3157)

Sciences

BIO: Biology

Consultant: Prof. Fred A. Rosenberg (College of Arts and Sciences) (437-4042)

Laboratory Coordinator: Jeffrey L. Wain (College of Arts and Sciences) (437-4046)

CHM: Chemistry

Consultant: Prof. Philip W. LeQuesne (College of Arts and Sciences) (437-2822)

Laboratory Coordinator: Bernard Lemire (College of Arts and Sciences) (437-2811)

Major Advisor, Chemical-Biological Technology: Dr. Carl F. Moxey (College of Arts and Sciences) (437-2260)

ESC: Earth Science

Consultant: Prof. David L. Wilmarth (College of Arts and Sciences) (437-3176)

MTH: Mathematics

Consultant: (University College) (437-2818)

Course Coordinator, Basic Mathematics:

Eugene Branca (University College) (437-2818)

Chemical-Biological Technology

Associate in Science Degree

The program in chemical-biological technology helps provide the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically, or biologically oriented organizations and for persons who have paramedical responsibilities. Employment opportunities may be found in hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments, and the emerging fields of oceanographic technology.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or *Basic Mathematics 1* and *2* (MTH 4001 and MTH 4002).

Bachelor of Science Degree

The Bachelor of Science degree program in chemical-biological technology is an interdisciplinary program integrating theoretical and laboratory courses from the fields of chemistry and biology. The program is designed to help prepare students for responsibilities in laboratory careers and in teaching general science. Employment opportunities may be found in a variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and as teachers of general science, chemistry, biology, and related courses at the secondary school level.

General Science Teacher Option: Students who plan to apply to the University's graduate Boston-Bouvé College of Human Development Professions must include courses in adolescent psychology and principles of teaching among their electives.

Chemical-Biological Technology Associate in Science Degree (Major Code 803)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
HST 4101		The Civilization of the Ancient and Medieval Worlds	3
HST 4102		The Civilization of the Early Modern World	3
HST 4103		The Civilization of the Modern World	3
MTH 4110	MTH 4111	MTH 4112	Mathematics 1, 2, 3 (9)
or		or	
MTH 4107	MTH 4108		College Algebra and Introduction to Calculus (8)
MTH 4120	MTH 4121		Calculus I and Calculus A 8
Major Concentration Courses			
BIO 4103	BIO 4104	BIO 4105	Biology 1, 2, 3 12
BIO 4175	BIO 4176	BIO 4177	Human Anatomy and Physiology 1, 2, 3 9
BIO 4190	BIO 4191	BIO 4192	Microbiology 1, 2, 3 9
CHM 4111	CHM 4112	CHM 4113	General Chemistry 1, 2, 3 9
CHM 4261	CHM 4262	CHM 4263	Organic Chemistry 1, 2, 3 (12)
or		or	
CHM 4221	CHM 4222	CHM 4223	Analytical Chemistry 1, 2, 3 (9)
PHY 4104	PHY 4105	PHY 4106	General Physics 1, 2, 3 6
Electives			
Social Sciences			9
Chemistry or Biology as needed to complete total credits			
Total Quarter Hours			96-100

Chemical-Biological Technology Bachelor of Science Degree (Major Code 804)**Core Courses**

quarter hours

ENG 4110	ENG 4111		Critical Writing I, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111	MTH 4112	Mathematics I, 2, 3	(9)
or			or	
MTH 4107	MTH 4108		College Algebra and Introduction to Calculus	(8)
MTH 4120	MTH 4121		Calculus I and Calculus A	8
BIO 4103	BIO 4104	BIO 4105	Biology I, 2, 3	12
BIO 4175	BIO 4176	BIO 4177	Human Anatomy and Physiology I, 2, 3	9
CHM 4111	CHM 4112	CHM 4113	General Chemistry I, 2, 3	9
PHY 4104	PHY 4105	PHY 4106	General Physics I, 2, 3	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems I, 2, 3	9
HST 4101			The Civilization of the Ancient and Medieval Worlds	3
HST 4102			The Civilization of the Early Modern World	3
HST 4103			The Civilization of the Modern World	3
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3
SOC 4102			Critical Issues Facing Society	3

Major Concentration Courses

BIO 4190	BIO 4191	BIO 4192	Microbiology I, 2, 3	9
BIO 4224	BIO 4225	BIO 4226	Ecology I, 2, 3	9
BIO 4235	BIO 4236	BIO 4237	Genetics I, 2, and Lab	(8)
or			or	
BIO 4246	BIO 4247	BIO 4248	Cell Biology I, 2, and Lab	(8)
BIO 4350	BIO 4351	BIO 4352	Histology-Organology I, 2, 3	6
CHM 4221	CHM 4222	CHM 4223	Analytical Chemistry I, 2, 3	9
CHM 4261	CHM 4262	CHM 4263	Organic Chemistry I, 2, 3	12
CHM 4321	CHM 4322		Instrumental Analysis I, 2	6
CHM 4323			Radiochemistry	3
CHM 4381	CHM 4382	CHM 4383	Physical Chemistry I, 2, 3	(9)
or			or	
CHM 4371	CHM 4372	CHM 4373	Biochemistry I, 2, 3	(9)
ESC 4215	ESC 4216	ESC 4217	Principles of Oceanology I, 2, 3	9

Electives as needed to complete total credits**Total Quarter Hours****175-178**

Health Management

The Bachelor of Science degree program in health management is designed for those who wish to prepare, on a part-time basis, for entry

into or advancement in managerial positions in the health care field. This program includes a special concentration of professional courses to prepare for licensure examination in long-term care administration.

Health Management Bachelor of Science Degree (Major Code 860)

Core Courses

				quarter hours
ENG 4110	ENG 4111		Critical Writing I, 2	6
ENG 4112			Approaches to Literature	3
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems I, 2, 3	9
MTH 4110	MTH 4111		Mathematics I, 2	6
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
BIO 4103	BIO 4104	BIO 4105	Biology I, 2, 3	12
BIO 4175	BIO 4176	BIO 4177	Anatomy and Physiology I, 2, 3	9
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3
SOC 4102			Critical Issues Facing Society	3
ACC 4101	ACC 4102		Accounting Principles I, 2	6
FI 4301			Principles of Finance	3
HMG 4200			Health Science Statistics	3
HMG 4430	HMG 4431		Communications for Health Care Personnel I, 2	6
HRM 4310			Personnel Management I	3
MGT 4101	MGT 4102		Introduction to Business and Management I, 2	6
MIS 4101			Introduction to Data Processing and Information Systems I	3
MIS 4355			Information Processing in Medicine	3

Major Concentration Courses

HMG 4100	HMG 4101	Hospital Organization and Management I, 2	6
HMG 4215		Hospital Law and Ethics	3
HMG 4301		Health Care Delivery	3
HMG 4310		Principles and Practices of Community Health I	3
HMG 4400	HMG 4401	Health Care Financial Management I, 2	6
HRA 4302		Medical Terminology Survey	3
HSC 4301	HSC 4302	Foundations of Medical Science I, 2	6

Electives

Social Science or Humanities Electives	15
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Option 1: Long-Term Care Administration

For licensure as a nursing home administrator, the Board of Registration of Nursing Home Administrators in Massachusetts requires an internship, a licensure examination, and a bachelor's degree. The required courses in this option help prepare students for the Massachusetts licensure examination. Students are cautioned, however, to contact the Board of Registration of Nursing Home Administrators for the specific eligibility requirements to sit for this examination.

HMG 4600	HMG 4601	HMG 4602	Long-Term Care Administration A, B, C*	18
SOC 4225			Social Gerontology	3
<i>Select 12 quarter hours from the following:</i>				
HMG 4300			Home Health Care	(3)
HMG 4425	HMG 4426		Applied Health Care Management I, 2	(6)
HSC 4210			Basic Nutrition	(3)
HSC 4220			Basic Pharmacology	(3)
HSC 4315			Environmental Problems and Health	(3)
HSC 4610			Geriatric Nutrition	(3)
REC 4101	REC 4102	REC 4103	Principles and Practices of Therapeutic Recreation I, 2, 3	(9)

Option 2: Community Health Management

HMG 4311			Principles and Practices of Community Health 2	3
HMG 4425	HMG 4426		Applied Health Care Management I, 2	6
HSC 4310			Public Health I	3
MLS 4341			Epidemiology I	3
<i>Select 18 quarter hours from the following:</i>				
HMG 4300			Home Health Care	(3)
HMG 4550	HMG 4551		Contemporary and Controversial Health Care Issues I, 2	(6)
HMG 4610			Principles and Practices of Community Mental Health	(3)
HSC 4210			Basic Nutrition	(3)
HSC 4220			Basic Pharmacology	(3)
HSC 4311			Public Health 2	(3)
HSC 4315			Environmental Problems and Health	(3)
HSC 4610			Geriatric Nutrition	(3)
MLS 4342			Epidemiology 2	(3)
SOC 4215			Medical Sociology	(3)

Total Quarter Hours

174

*Students who, in years past, may have successfully completed any courses in Long-Term Care Administration (former sequence 86.340 through 86.345) are required to call the Program Director's office (617-437-2818) prior to registering for Long-Term Care Administration A, B, or C.

Health Record Administration

The health record administrator has varied responsibilities relating to health information systems, including the organization, operation, and management of health record services. Required skills include the ability to design health information and retrieval systems; to plan, organize, and direct health record services; to develop, analyze, and evaluate health records and indexes; to work with medical and administrative staffs in developing methods for evaluation of patient care; and to do research projects using health care information.

Successful completion of this program qualifies students for admission to the professional registration examinations conducted by the American Medical Record Association.

Potential students must be interviewed by the Program Director. Arrangements may be made through the Health Records Office, 205 Mugar Building, telephone 617-437-3663.

Professional Certification

Persons who wish to qualify for admission to the professional examination leading to registration as a medical record administrator and who already hold a bachelor's degree in another field of study from a college or university acceptable to Northeastern University may undertake the Health Record Administration Certificate Program. Completion of this program with a cumulative quality-point average of 2.5 leads to certification from University College that the student has completed a professional program in health record science. In addition to the required courses, students must complete one year of a natural science, such as biology, chemistry, or microbiology. Students must also demonstrate an understanding of the principles of descriptive statistics. This requirement may be satisfied by successful completion of an approved statistics course or completion of ECN 4250 *Statistics I*

with a grade of C or better. These requirements are in addition to the laboratory course in anatomy and physiology.

Potential students must be interviewed by the program advisor. Arrangements may be made through the Health Records Office, 205 Mugar Building, telephone 617-436-3663.

In designated professional courses (*), students must obtain a grade of C or better. Only one professional course may be repeated. Students who receive a grade of D in more than one professional course will be asked to withdraw from the program.

Students who apply for the clinical courses HRA 4324, HRA 4325, and HRA 4326 must have a quality-point average of 2.5 and the approval of their advisor.

Health Record Administration Bachelor of Science Degree (Major Code 861)

Core Courses				quarter hours
ENG 4110	ENG 4111		Critical Writing I, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics I, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems I, 2, 3	9
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
BIO 4103	BIO 4104	BIO 4105	Biology I, 2, 3	12
BIO 4175	BIO 4176	BIO 4177	Anatomy and Physiology I, 2, 3*	9
ECN 4250	ECN 4251		Statistics I, 2*	6
<i>Choose one set of three courses:</i>				
HST 4101			The Civilization of the Ancient and Medieval Worlds	(3)
HST 4102			The Civilization of the Early Modern World	(3)
HST 4103			The Civilization of the Modern World	(3)
<i>or</i>		<i>or</i>		
POL 4103			Introduction to Politics	(3)
POL 4104			Introduction to American Government	(3)
POL 4105			Introduction to Comparative Politics	(3)
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3
SOC 4102			Critical Issues Facing Society	3
Major Concentration Courses				
HMG 4215			Hospital Law and Ethics*	3
HMG 4301			Health Care Delivery	3
HRA 4305	HRA 4306		Language of Medicine I, 2†	4
HRA 4308			Hospital Management for Health Record Administrators*	3
HRA 4310	HRA 4311	HRA 4312	Health Record Science I, 2, 3*	18
HRA 4313	HRA 4314		Health Record Science 4, 5*	12
HRA 4320	HRA 4321		Organization of the Health Record Department I, 2*	6
HRA 4324	HRA 4325	HRA 4326	Applied Health Record Science I, 2, 3*	9
HRA 4330			Health Record Computer Science*	3
HRA 4332			Topics in Health Records	3
HRM 4301			Organizational Behavior	3
HSC 4301	HSC 4302		Foundations of Medical Science I, 2*	6
MIS 4101			Introduction to Data Processing and Information Systems I	3
Electives				
Humanities (ART, ENG, LN, MUS, PHL)				6
Open Electives				18
Total Quarter Hours				178

*Students must obtain a grade of C or better in this course.

† A challenge examination is available for this course. Call 617-437-2525 for details.

Health Record Administration Certificate Program (Major Code 862)

Core Courses				quarter hours
BIO 4175	BIO 4176	BIO 4177	Anatomy and Physiology I, 2, 3	9
HMG 4215			Hospital Law and Ethics	3
HMG 4301			Health Care Delivery	3
HRA 4305	HRA 4306		Language of Medicine I, 2*	4
HRA 4308			Hospital Management for Health Record Administrators	3
HRA 4310	HRA 4311	HRA 4312	Health Record Science I, 2, 3	18
HRA 4313	HRA 4314		Health Record Science 4, 5	12
HRA 4320	HRA 4321		Organization of the Health Record Department I, 2	6
HRA 4324	HRA 4325	HRA 4326	Applied Health Record Science I, 2, 3	9
HRA 4330			Health Record Computer Science	3
HRA 4332			Topics in Health Records	3
HSC 4301	HSC 4302		Foundations of Medical Science I, 2	6
MIS 4101			Introduction to Data Processing and Information Systems I	(3)
or			or	
COM 4101			Foundations of Computer Literacy	(4)
Total Quarter Hours				82-83

*A challenge examination is available for this course. Call 617-437-2525 for details.

Health Science

The Bachelor of Science degree in health science is available to students holding registration, certification, or licensure (as defined by University regulations) in a specific health profession and trained in an approved program accredited by

the appropriate medical association (American Medical Association, National League for Nursing, American Dental Association, etc.)

Students interested in this program should consult with an academic advisor to determine their eligibility.

Health Science Bachelor of Science in Health Science Degree (Major Code 865)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing I, 2	6
ENG 4112		Approaches to Literature	3
Humanities (ART, ASL, DRA, ENG, JRN, LN, MUS, PHL, SPC, TCC)			9
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)			9

General

Select 15 quarter hours from any of the humanities or social science areas listed above.

Basic Sciences

BIO 4103	BIO 4104	Biology I, 2	8
BIO 4175	BIO 4176	BIO 4177	Anatomy and Physiology I, 2, 3
BIO 4190		Microbiology I	3
CHM 4111	CHM 4112	CHM 4113	General Chemistry I, 2, 3
or		or	
CHM 4101	CHM 4102	CHM 4103	Modern Chemistry I, 2, 3
MTH 4110	MTH 4111	Mathematics I, 2	(6)
or		or	
MTH 4107	MTH 4108	College Algebra and Introduction to Calculus	(8)

Advanced Sciences

Select a minimum of 9 quarter hours from the following:

BIO 4235	BIO 4236	BIO 4237	Genetics I, 2, 3	(8)
BIO 4246	BIO 4247	BIO 4248	Cell Biology I, 2, 3	(8)
BIO 4258	BIO 4259		Advanced Human Physiology I, 2	(6)
BIO 4320			Medical Microbiology	(4)
BIO 4350	BIO 4351	BIO 4352	Histology-Organology I, 2, 3	(6)
BIO 4461			Immunology	(4)
CHM 4261	CHM 4262	CHM 4263	Organic Chemistry I, 2, 3	(12)
HSC 4600			Advanced Nutrition	(3)
HSC 4601			Advanced Pharmacology	(3)
MLS 4321			Hematology	(3)
MLS 4322	MLS 4323		Morphologic Hematology I, 2	(6)

Continued

Major Concentration Courses**Basic**

HMG 4200		Health Science Statistics	3
HSC 4301	HSC 4302	Foundations of Medical Science 1, 2	6
<i>Select 18 quarter hours from the following:</i>			
HMG 4301		Health Care Delivery	(3)
HMG 4310	HMG 4311	Principles and Practices of Community Health 1, 2	(6)
HMG 4550	HMG 4551	Contemporary and Controversial Health Care Issues 1, 2	(6)
HMG 4610		Principles and Practices of Community Mental Health	(3)
HSC 4210		Basic Nutrition	(3)
HSC 4215		Hospital Law and Ethics	(3)
HSC 4220		Basic Pharmacology	(3)
HSC 4310	HSC 4311	Public Health 1, 2	(6)
HSC 4315		Environmental Problems and Health	(3)
MLS 4341		Epidemiology 1	(3)
REC 4460		Process of Aging	(3)

Students with a clinical laboratory background may choose 18 quarter hours from the following instead:

BIO 4235	BIO 4236	BIO 4237	Genetics 1, 2, 3*	(8)
BIO 4246	BIO 4247	BIO 4248	Cell Biology 1, 2, 3*	(8)
BIO 4350	BIO 4351	BIO 4352	Histology-Organology 1, 2, 3*	(6)
BIO 4461			Immunology*	(4)
CHM 4224			Analytical Chemistry	(4)
CHM 4381	CHM 4382	CHM 4383	Physical Chemistry 1, 2, 3	(9)

Advanced

Select 6 to 9 quarter hours from the following:

HMG 4210	HMG 4211	Medical Care and Current Social Problems 1, 2	(6)
HMG 4400	HMG 4401	Health Care Finance 1, 2	(6)
HMG 4425	HMG 4426	Applied Health Care Management 1, 2	(6)
HMG 4430	HMG 4431	Communications for Health Care Personnel 1, 2	(6)
HSC 4602		Methods and Materials of Public Health Education	(3)
HSC 4610		Geriatric Nutrition	(3)
HSC 4613		Oral Microbiology	(3)
HSC 4614	HSC 4615	Advanced Periodontology 1, 2	(6)
MLS 4342		Epidemiology 2	(3)

Continued

Students with a clinical laboratory background may choose 6 to 9 quarter hours from the following instead:

BIO 4191	BIO 4192	Microbiology 2, 3	(6)
BIO 4258	BIO 4259	Advanced Human Physiology 1, 2*	(6)
BIO 4320		Medical Microbiology*	(4)
CHM 4321	CHM 4322	Instrumental Analysis 1, 2	(6)
CHM 4323		Radiochemistry	(3)
MLS 1323		Hemostasis†	(2)
MLS 1324		Histochemistry†	(2)
MLS 1331		Clinical Immunology†	(3)
MLS 1333		Immunohematology†	(2)
MLS 4322	MLS 4323	Morphologic Hematology 1, 2*	(6)
MLS 4365		Quality Control	(3)

Electives and/or transfer credits to equal	40–43
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Total Quarter Hours	174
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*These courses may be used in only one category; requirements must be fulfilled in each category.

† Tuition for this course is at the Basic College tuition rate.

Medical Laboratory Science— Medical Technology

Medical laboratory science (MLS) is concerned with laboratory examination of material necessary for proper monitoring of health and for the diagnosis and treatment of illness. Medical laboratory technicians and technologists work in a variety of specialized fields, such as microbiology, blood banking, hematology, or clinical chemistry, or as generalists in all these areas.

The associate's degree medical laboratory technician works under the direct supervision of a medical technologist and performs most of the common medical laboratory tests. The bachelor's degree medical technologist is considered qualified to perform, with little or no direct supervision, levels of laboratory tests from the simplest to the most complex. With additional education or experience, medical technologists may also function as educators, researchers, or supervisors. Some serve as sales and technical representatives for scientific supply and equipment companies; others serve in government positions.

Both degree programs are conducted in affiliation with hospitals in the Boston area. The bachelor's degree is accredited by the Committee of Allied Health Education and Accreditation of the American Medical Association. Upon successful completion of either program, the student is eligible to take a national certification examination given by the National Certification Agency for Medical Laboratory Personnel or the Board of Registry of the American Society of Clinical Pathology.

The basic courses in medical laboratory science, science, and education are offered evenings, but the advanced medical laboratory science courses and the clinical experience are offered full time only during the day.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or *Introduction to Mathematics I* and 2 (MTH 4110, MTH 4111).

Associate's Degree Professional Requirements

A clinical applied study program (or appropriate work experience) is a required component of this degree. Work experience is acceptable if it meets the requirements for certification of either

the National Certification Agency for Medical Laboratory Personnel or the Board of Registry of the American Society of Clinical Pathologists. Students without appropriate work experience may apply for clinical applied studies through the University College MLS Clinical Coordinator, 206 Mugar, telephone 617-437-3664. This should be done one year in advance of the anticipated entry into clinical courses.

Prerequisites for clinical applied studies are a minimum of a 2.0 quality-point average in the required courses and a C- or better in each medical laboratory science (MLS) course. These basic courses are available during the evening and, on an every-other-year basis, through the College of Pharmacy and Allied Health Professions. Students register for these courses in the College of Pharmacy and Allied Health Professions, 206 Mugar. Tuition is at the Basic College rate. These courses should be completed within three years of applying to the AD-MLT Clinical Applied Studies.

Bachelor's Degree Professional Requirements

Clinical applied study courses are available on a full-time basis only and are offered through the College of Pharmacy and Allied Health Professions. Students must apply for applied study courses one year in advance. A minimum of four quarters of full-time study is necessary for completion of the program requirements. During this time the student must meet all the requirements of the last four quarters of the undergraduate Basic College curriculum for the Bachelor of Science degree. Students register for clinical applied study in the College of Pharmacy and Allied Health Professions, 206 Mugar. Tuition is at the Basic College rate.

Prerequisites for the clinical applied study component include completion of each MLS course with a C- or better within five years of application to the applied study and completion of all other courses with a quality-point average of 2.5 or better.

**Medical Laboratory Science—Medical Laboratory Technician
Associate in Science Degree (Major Code 800)**

Core Courses			quarter hours	
ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
HMG 4210		Medical Care and Current Social Problems	3	
HMG 4215		Hospital Law and Ethics	3	
MTH 4107	MTH 4108	College Algebra and Introduction to Calculus	8	
BIO 4103	BIO 4104	BIO 4105	Biology 1, 2, 3	12
BIO 4175	BIO 4176	BIO 4177	Human Anatomy and Physiology 1, 2, 3	9
CHM 4111	CHM 4112	CHM 4113	General Chemistry 1, 2, 3	9
CHM 4224		Analytical Chemistry	4	
Major Concentration Courses				
MLS 1311		Basic MLS Urinalysis*	2	
MLS 1321	MLS 1322	Basic MLS Hematology 1, 2*	4	
MLS 1330		Basic MLS Immunohematology*	2	
MLS 1331		Basic MLS Clinical Immunology*	3	
MLS 1341		Basic MLS Clinical Microbiology*	4	
MLS 1351		Basic MLS Clinical Chemistry*	4	
MLS 4301		Medical Laboratory Science Orientation	2	
Electives				
Computer Science			3	
Humanities			6	
Social Science			3	
Open Electives			6	
Total Quarter Hours			96	

*Tuition for this course is at the Basic College rate.

Medical Technology—Medical Technologist Bachelor of Science Degree (Major Code 801)

	quarter hours
Credits from Medical Laboratory Science associate's degree program	96

Core Courses

BIO 4190			Microbiology I	3
BIO 4235	BIO 4236	BIO 4237	Genetics I, 2, and Lab	8
BIO 4246	BIO 4247	BIO 4248	Cell Biology I, 2, and Lab	8
CHM 4261	CHM 4262	CHM 4263	Organic Chemistry I, 2, 3	12
MLS 4351			Epidemiology I	3
PHY 4104	PHY 4105	PHY 4106	General Physics I, 2, 3	6
PHY 4174			Physics Laboratory 2	2

Major Concentration Courses

Please refer to the current Northeastern University *Basic Day College Course Description and Curriculum Guide* for course descriptions of the following clinical applied-study courses. Tuition for these courses is at the Basic College rate; to register, call 617-437-3664.

MLS 1523			Applied Hematology	4
MLS 1532			Applied Immunohematology	3
MLS 1544			Applied Clinical Microbiology	7
MLS 1552			Applied Clinical Chemistry	7
MLS 1621	MLS 1622		Advanced Hematology I, 2	5
MLS 1631			Advanced Immunohematology	2
MLS 1642			Medical Parasitology	2
MLS 1643			Medical Mycology	3
MLS 1645	MLS 1646	MLS 1647	Advanced Clinical Microbiology I, 2, 3	6
MLS 1651	MLS 1652	MLS 1653	Advanced Clinical Chemistry I, 2, 3	6
MLS 1661			MLS Education	2
MLS 1665			MLS Management	2
MLS 1680			MLS Special Topics	2
MLS 1681			MLS Senior Seminar	2
MLS 1890			Undergraduate Research (Optional)	(2)

Electives

Psychology and statistics are strongly recommended electives.

Computer Science	3
Humanities	3
Social Science	3
Open Electives	3

Total Quarter Hours

203–205

Medical Laboratory Science — Hematology

Hematology is a specialty within medical laboratory science. Hematology technologists may be employed in hospitals and clinical laboratories, where they perform specific laboratory tests that aid in the diagnosis, treatment, and follow-up of infections, anemias, leukemias, and bleeding disorders.

The requirements for categorical certification in hematology are indicated by the Board of Registry of the American Society of Clinical Pathologists and the National Certification Agency. Students should contact the American Society of Clinical Pathologists, Board of Registry, P.O. Box

96215, Chicago, IL 60693, and the National Accrediting Agency for Clinical Laboratory Science, 547 W. Jackson Boulevard, Suite 608, Chicago, IL 60606, for details concerning eligibility to write the hematology examination.

The hematology curriculum is designed primarily for those who already work in this field.

All medical laboratory science clinical courses are offered directly through the College of Pharmacy and Allied Health Professions. Students must register for the courses through this college, 206 Mugar, telephone 617-437-3664. Tuition is at the Basic College rate. A grade of C- or better is required in the professional courses.

Hematology Bachelor of Science Degree (Major Code 807)

Core Courses

quarter hours

ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
MTH 4107	MTH 4108		College Algebra and Introduction to Calculus	8
BIO 4103	BIO 4104	BIO 4105	Biology 1, 2, 3	12
BIO 4175	BIO 4176	BIO 4177	Human Anatomy and Physiology 1, 2, 3	9
BIO 4190			Microbiology 1	3
BIO 4235	BIO 4236	BIO 4237	Genetics 1, 2, and Lab	8
BIO 4246	BIO 4247	BIO 4248	Cell Biology 1, 2, and Lab	8
CHM 4111	CHM 4112	CHM 4113	General Chemistry 1, 2, 3	9
CHM 4221	CHM 4222	CHM 4223	Analytical Chemistry 1, 2, 3	(9)
or			or	
CHM 4224			Analytical Chemistry (Summer Intensive)	(4)
CHM 4261	CHM 4262	CHM 4263	Organic Chemistry 1, 2, 3	12
HMG 4100	HMG 4101		Hospital Organization and Management 1, 2	6
HMG 4210	HMG 4211		Medical Care and Current Social Problems	6
HMG 4215			Hospital Law and Ethics	3
PHY 4104	PHY 4105	PHY 4106	General Physics 1, 2, 3	6
PHY 4174			Physics Laboratory 2	2

Continued

Major Concentration Courses

HSC 4320	HSC 4321	Health Science Education 1, 2	6
MLS 1311		Basic MLS Urinalysis*	2
MLS 1321		Basic MLS Hematology 1*	2
MLS 1322		Basic MLS Hematology 2*	2
MLS 1323		Advanced Hemostasis Techniques*	2
MLS 1324		Histochemistry*	2
MLS 1330		Basic MLS Immunohematology*	2
MLS 1331		Basic MLS Clinical Immunology*	3
MLS 1333		Immunohematology*	2
MLS 1341		Basic MLS Clinical Microbiology*	4
MLS 1351		Basic MLS Clinical Chemistry*	4
MLS 1642		Medical Parasitology (offered days only)*	2
MLS 1890		Undergraduate Research*	2
MLS 4301		MLS Orientation (required if not working in the field)	2
MLS 4322	MLS 4323	Morphologic Hematology 1, 2	6
MLS 4365		Quality Control	3

Electives

Histology, psychology, economics, sociology, statistics, hematology, a computer course, and epidemiology are strongly recommended electives.

Humanities	9
Social Sciences	9
Open Electives	18

Total Quarter Hours**187–192**

*Tuition for this course is at the Basic College rate. Please refer to the current Northeastern University *Basic Day College Course Description and Curriculum Guide* for the course description. To register, call 617-437-3664.

Nursing (Evening Section)

A Bachelor of Science in Nursing degree is available to registered nurses in collaboration with the College of Nursing, which is fully accredited by the National League for Nursing.

University College's Bachelor of Science in Nursing program is unique in that it allows students to fulfill, in the evening, both classroom and clinical components of *Nursing Transition* (NUR 4300), *Community Health Nursing* (NUR 4500), *Contemporary Nursing* (NUR 4501), and *Introduction to Nursing Research* (NUR 4502). It is unique, too, in that a registered nurse who completes *Nursing Transition* (NUR 4300) with a grade of B or better is eligible for 22 quarter hours of advanced placement credit, plus any transfer credits University College may accept from another institution.

Admission Procedure

The following credentials are required to enter the part-time evening program and should be forwarded to the Director of Academic and Student Affairs, University College, Northeastern University, 360 Huntington Avenue, Boston, MA 02115:

- a résumé detailing education, professional work experience, and professional and community activities
- official transcripts from high school, college or university, and basic nursing school (the nursing school transcript should include a senior summary statement)
- a copy of your Massachusetts Registered Nurse license
- a completed Nursing Program Application (available from the Office of Academic and Student Affairs)
- a reference from your most recent nursing employer
- proof of satisfactory completion of the NLN Mobility Profile II Examination

Pre-admission counseling is available by calling the Office of Academic and Student Affairs at 617-437-2400.

Planning a Program of Study

Potential students must plan their program of study with the Academic Coordinator.

Appointments may be arranged by calling 617-437-2818.

Potential and current students are encouraged to attend group information sessions in order to increase their awareness of University College and College of Nursing policies. These sessions cover course requirements, promotional policies, advanced placement examinations, and nursing course petition procedures. To register, call 617-437-2818.

Nursing (Evening Section)**Bachelor of Science in Nursing Degree (Major Code 809)**

Core Courses				quarter hours
ENG 4110	ENG 4111		Critical Writing I, 2	6
ENG 4112			Approaches to Literature	3
BIO 4103	BIO 4104		Biology I, 2	8
BIO 4175	BIO 4176	BIO 4177	Human Anatomy and Physiology I, 2, 3	9
BIO 4190			Microbiology I	3
CHM 4111	CHM 4112	CHM 4113	General Chemistry I, 2, 3	9
NUR 4302			Pharmacodynamics	(3)
or			or	
HSC 4601			Advanced Pharmacology	(3)
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
PSY 4240	PSY 4241	PSY 4242	Developmental Psychology I, 2, 3	9
PSY 4270	PSY 4271		Social Psychology I, 2	6
SOA 4101			Cultural Anthropology: Preiterate Societies	3
SOA 4102			Cultural Anthropology: Industrial Societies	3
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3

Major Concentration Courses

NUR 4300	Nursing Transition*	9
NUR 4301	Psychiatric Mental Health Nursing†	7
NUR 4400	Maternal Child Nursing†	9
NUR 4401	Medical Surgical Nursing†	9
NUR 4500	Community Health Nursing	9
NUR 4501	Contemporary Nursing	5
NUR 4502	Introduction to Nursing Research	4

Electives

History	3
Humanities	9
Open Electives	15

Total Quarter Hours**178**

*To enroll in NUR 4300, students must submit a petition to the Academic Coordinator at least one full quarter in advance of registering. Students must also obtain a health clearance from the Lane Health Center and present evidence of having had a tuberculin skin test within the previous 12 months. Advanced standing credit is awarded upon completion of this course with a grade of B or better.

† Challenge examinations are available for this course through the NLN Mobility Profile II Examination, a component of the admissions process.

Radiologic (X-ray) Technology

The Radiologic Technology program is a joint offering of the University and several area hospitals. Classroom experiences are provided by the University and the laboratory practicum is conducted at an assigned affiliated hospital. The program is accredited by the Council on Medical Education of the American Medical Association.

The radiologic technologist is an important figure in the diagnostic and therapeutic environment of the hospital or clinic and in industrial production, quality control, and inspection laboratories. Responsibilities demand rapport with internists, surgeons, pathologists, nurses, and laboratory personnel. Industrial competency requires close association with metallurgists, production and manufacturing specialists, engineers, and scientists.

Prerequisite: Satisfactory completion of three years of high school math (*Algebra 1* and *2* and geometry), one year of biology, and one year of chemistry or physics. Applicants must also satisfactorily complete the Scholastic Aptitude Test (SAT) and submit one letter of recommendation

from a science instructor. In addition, applicants must satisfy general University requirements and satisfactorily complete the University's Mathematics Placement Test. Candidates who successfully meet the above requirements may then schedule an interview with the Radiologic Technology program director.

Associate in Science Degree Program

The Associate in Science degree program is a 29-month, full-time, day program. Graduates are eligible to sit for examination for certification by the American Registry of Radiologic Technologists. Students who complete the associate's degree and are interested in a bachelor's degree may want to consider the Health Science or Health Management major. These students are encouraged to discuss these options with an academic advisor.

Part-time Evening Program

Candidates who wish to apply to the part-time Associate in Science degree program in radiologic technology must be certified by the American Registry of Radiologic Technologists.

Radiologic Technology Associate in Science Degree (Major Code 806)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
MTH 4110	MTH 4111	Mathematics 1, 2	6
PSY 4110		Fundamental Issues in Psychology	3
PSY 4111		Developmental Aspects in Psychology	3
BIO 4103	BIO 4105	Biology 1, 3	8
MGT 4101		Introduction to Business and Management I*	3
MIS 4101		Introduction to Data Processing and Information Systems I	3

Continued

Major Concentration Courses

RAD 4100	RAD 4101	Radiologic Technology Orientation I, 2	6
RAD 4102	RAD 4103	Radiologic Science I, 2	8
RAD 4104	RAD 4105	Principles of Radiology I, 2	8
RAD 4106	RAD 4107	Radiologic Photography and Exposure I, 2	8
RAD 4112	RAD 4114	Gross Anatomy and General Physiology I, 2	6
RAD 4113	RAD 4115	Anatomy and Physiology Lab I, 2	2
RAD 4300	RAD 4301	Advanced Radiologic Technology I, 2	6
RAD 4302		Imaging Modalities*	3
RAD 4303		Radiation Protection and Radiobiology*	3
RAD 4108	RAD 4109	RAD 4110	Radiologic Clinical
RAD 4111		Practicum I, 2, 3, 4	12
RAD 4304		Cross-Sectional Anatomy	4

Total Quarter Hours **101**

*Courses are scheduled in the late afternoon for certificate students who wish to continue for the Associate in Science degree.

Radiologic Technology Part-time Evening Program
Associate in Science Degree (Major Code 806)
Core Courses quarter hours

Transfer credit for completion of prerequisite*			50
ENG 4110	ENG 4111	Critical Writing I, 2	6
ENG 4112		Approaches to Literature	3
MTH 4110	MTH 4111	Mathematics I, 2	6
PSY 4110		Fundamental Issues in Psychology	(3)
or		or	
SOC 4100		Fundamental Issues in Sociology	(3)
PSY 4111		Developmental Aspects in Psychology	(3)
or		or	
SOC 4101		The Individual and Social Roles	(3)
BIO 4103	BIO 4105	Biology I, 3	8
MGT 4101		Introduction to Business and Management I	3
MIS 4101		Introduction to Data Processing and Information Systems I	3

Major Concentration Courses

RAD 4300	RAD 4301	Advanced Radiologic Technology I, 2†	6
RAD 4302		Imaging Modalities†	3
RAD 4303		Radiation Protection and Radiobiology	3
RAD 4304		Cross-Sectional Anatomy	4

Total Quarter Hours **101**

*Prerequisite: Satisfactory completion of a certificate program in radiologic technology or registration by the American Registry of Radiologic Technologists.

† Courses are scheduled in the late afternoon for certificate students who wish to continue for the Associate in Science degree.

Therapeutic Recreation Services

Therapeutic recreation, which is concerned with the revitalization of the mind, body, spirit, and skills of people in rehabilitation facilities, community settings, nursing homes, and hospitals, has emerged as an important part of the team concept in human services.

The Therapeutic Recreation Certificate verifies that a basic level of competence in this field has been attained. The Massachusetts Recreation and Park Association recognizes both the certificate

and associate's degree programs in its professional registration plan. The associate's degree program leads to a paraprofessional classification with the National Council for Therapeutic Recreation Certification.

Students in the certificate and associate's degree programs may go on to pursue a Bachelor of Science degree in Health Management or Sociology in University College or in Therapeutic Recreation in the day, undergraduate program of Northeastern's Department of Health, Sport, and Leisure Studies.

Therapeutic Recreation Services Activity Leader Certificate Program (Major Code 601)

Core Courses		quarter hours
ENG 4110	Critical Writing I	3

Major Concentration Courses

REC 4101	REC 4102	REC 4103	Principles and Practices of Therapeutic Recreation I, 2, 3	9
REC 4110	REC 4111		Group Dynamics and Leadership I, 2	6
REC 4500	REC 4501		Field Practicum in Therapeutic Recreation I, 2*	(8)
or			or	
REC 4802	REC 4803		Independent Study I, 2†	(8)

Electives

Select 6 quarter hours from the following:

REC 4300	REC 4301	Arts and Crafts I, 2	(6)
REC 4310		Social Recreation	(3)
REC 4311		Music Therapy	(3)
REC 4312		Media Resources and Techniques	(3)
REC 4313		Therapeutic Use of Dramatics	(3)

Select 6 quarter hours from the following:

REC 4401		The Nursing Home Experience	(3)
REC 4410		Therapeutic Recreation in Rehabilitation	(3)
REC 4425		Mental Illness and Retardation	(3)
REC 4430		Therapeutic Recreation in Child Development	(3)
REC 4440		Humanistic Approaches to Recreational Therapy	(3)
REC 4445		Community Recreation for the Handicapped	(3)
REC 4460		The Process of Aging	(3)
REC 4461		Camping for the Disabled	(3)
REC 4462		Leisure Counseling	(3)

Total Quarter Hours

38

*See course description for prerequisites; eligibility is determined by the program consultant. Petitions can be obtained in the Health Professions Program office and should be filed at least one quarter in advance of the start of the practicum.

†Permission is required for this option.

Therapeutic Recreation Services Associate in Science Degree (Major Code 600)**Core Courses**

quarter hours

ENG 4110	ENG 4111		Critical Writing I, 2	6
ENG 4112			Approaches to Literature	3
BIO 4103	BIO 4104		Biology I, 2	8
BIO 4175	BIO 4176	BIO 4177	Anatomy and Physiology I, 2, 3	9
HRA 4302			Medical Terminology Survey	3
HSC 4301	HSC 4302		Foundations of Medical Science I, 2	6
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
SOC 4225			Social Gerontology	3

Major Concentration Courses

REC 4101	REC 4102	REC 4103	Principles and Practices of Therapeutic Recreation I, 2, 3	9
REC 4110	REC 4111		Group Dynamics and Leadership I, 2	6
REC 4420			Activity and Movement Analysis	3
REC 4500	REC 4501		Field Practicum in Therapeutic Recreation I, 2*	(8)
or			or	
REC 4802	REC 4803		Independent Study I, 2†	(8)

Electives*Select 24 quarter hours from the following:*

REC 4300	REC 4301	Arts and Crafts I, 2	6
REC 4310		Social Recreation	3
REC 4311		Music Therapy	3
REC 4312		Media Resources and Techniques	3
REC 4313		Therapeutic Use of Dramatics	3

Select 6 quarter hours from the following:

REC 4401		The Nursing Home Experience	3
REC 4410		Therapeutic Recreation in Rehabilitation	3
REC 4425		Mental Illness and Retardation	3
REC 4430		Therapeutic Recreation in Child Development	3
REC 4440		Humanistic Approaches to Recreational Therapy	3
REC 4445		Community Recreation for the Handicapped	3
REC 4460		The Process of Aging	3
REC 4461		Camping for the Disabled	3
REC 4462		Leisure Counseling	3

Total Quarter Hours**97**

*See course description for prerequisites; eligibility is determined by the program consultant. Petitions may be obtained in the Health Professions Program office and should be filed at least one quarter in advance of the start of the practicum.

† Permission is required for this option.



Law Enforcement Degree Programs

Robert D. Croatti, *Associate Dean*
Acting Director, Law Enforcement Programs

144 Knowles-Volpe Hall
 617-437-3327

Purpose

Law enforcement programs are designed to provide students with a broadly based, undergraduate education with a professional focus, to ensure that program graduates are academically prepared to enter or advance in careers in criminal justice or security administration or to enroll in graduate or professional schools.

Programs

Requirements for each program are outlined on the following pages. Upon petition, students may be permitted to substitute other courses that will more adequately serve their specific objectives.

Bachelor of Science Degree Programs

Programs leading to the Bachelor of Science degree are offered in correctional practices, law enforcement, and security. Students should choose their major field of study in consultation with a program advisor.

Each curriculum provides for not less than 174 quarter hours of work, including at least 75 quarter hours of advanced work in a major field.

Transfer students must complete at least 45 quarter hours of academic work at University College immediately preceding graduation in order to be eligible for a degree.

Associate in Science Degree Programs

Programs leading to the associate's degree are offered for those who wish to obtain a general background in correctional practices, law enforcement, or security and who may later wish to pursue a bachelor's degree.

Candidates for the Associate in Science degree must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements for the Bachelor of Science degree and includes at least 48 quarter hours of work in a major field.

Honors Program

The Honors Program is designed to provide qualified students with the opportunity to achieve broader experience within their chosen fields.

In general, the program consists of independent study, a directed reading seminar, independent research projects, and special seminars. Each student's program is arranged in consultation with the Program Director and the Honors Faculty Committee.

The Honors Program is open to all law enforcement degree candidates in University College who have obtained an associate's degree or equivalent and have a minimum cumulative grade-point average of 3.0. Students who are eligible for this program may apply for admission to the Director of Law Enforcement Programs.

For course descriptions, see page 152.

Course Sequence

Upon completion of the courses required for admission, the student should elect courses from the core and major concentration areas to fulfill the requirements for the Associate in Science and the Bachelor of Science degrees.

Degree requirements may be completed at the student's own pace. A total of 32 courses is required for an Associate in Science degree, which may be completed in as little time as three years, or nine academic quarters. A Bachelor of Science degree may be completed over a period of five years, or 15 academic quarters. This schedule averages out to four courses per academic quarter.

Distribution Requirements

In order to satisfy the distribution requirements in any law enforcement program, students should first discuss their programs with an academic advisor.

English courses ENG 4110, ENG 4111, and ENG 4112 (9 quarter hours), must be taken prior to admission to a degree program. The remaining required courses, amounting to 33 to 36 quarter hours, should be taken from the core and major concentration courses as listed on the following pages.

Field Work Courses

Field work courses (see LEN 4899) provide an opportunity for students to apply their academic background to practical problems in the areas of law enforcement, corrections, and security.

A field work course shall have the following characteristics:

- 1 It shall be a one-quarter course worth 6 quarter hours of credit.
- 2 Only degree candidates may register.
- 3 Prior to registration, each student should consult with the Program Director.
- 4 Each student shall meet with the departmental field work advisor as frequently as the advisor feels necessary, but in any case no fewer than three times per quarter: once to formulate the program of field work experience, once to discuss ongoing work, and once to transmit and discuss the written report.
- 5 Each student shall spend a minimum of 15 hours per week at the outside agency on a volunteer or paid basis.
- 6 The student's grade shall be dependent upon both the quality of the experience as demonstrated in the final report and the discussions between the field work advisor and the outside supervisor.
- 7 Each student shall make his or her own arrangements for carrying on suitable field work at a departmentally acceptable agency involving field work experience.
- 8 The Program Director will participate in a student's placement solely in an advisory capacity.

Correctional Practices Associate in Science Degree (Major Code 945)**Core Courses**

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
PHL 4230		Ethics in Theory and Practice	3
PHL 4231		Current Topics in Ethics	3
SOC 4100		Fundamental Issues in Sociology	3
SOC 4101		The Individual and Social Roles	3
SOC 4102		Critical Issues Facing Society	3

Major Concentration Courses

LEN 4112		The American Correctional System	3
LEN 4115	LEN 4116	Correctional Administration 1, 2	6
LEN 4132	LEN 4133	Administration of Justice 1, 2	6
LEN 4136	LEN 4137	Criminal Law 1, 2	6
LEN 4315	LEN 4316	Criminology 1, 2	6

Electives**Law Enforcement**

Select 21 quarter hours from the following courses. Not more than 9 quarter hours of seminar courses may be elected to satisfy this requirement.

LEN 4120	LEN 4121	Juvenile Corrections 1, 2	(6)
LEN 4126		Correctional Practices Seminar	(3)
LEN 4128		Victimology Seminar	(3)
LEN 4129		Criminal Behavior Seminar	(3)
LEN 4138	LEN 4139	Evidence and Court Procedure 1, 2	(6)
LEN 4300		Human Rights in Corrections	(3)
LEN 4302		Correctional Counseling	(3)
LEN 4305	LEN 4306	Advanced Correctional Practices 1, 2	(6)
LEN 4311		Research Methods in Criminal Justice	(3)
LEN 4312	LEN 4313	Treatment of Offenders 1, 2	(6)
LEN 4317	LEN 4318	Probation and Parole Practices 1, 2	(6)
LEN 4899		Field Work in Law Enforcement, Correctional Practices, and Security	(6)

Continued

Other Electives*Select 24 quarter hours from the following:*

ASL 4101	ASL 4102	American Sign Language 1, 2	(8)	
HRM 4301		Organizational Behavior	(3)	
HRM 4302		Introduction to Human Resources Management	(3)	
HST 4101		The Civilization of the Ancient and Medieval Worlds	(3)	
HST 4102		The Civilization of the Early Modern World	(3)	
HST 4103		The Civilization of the Modern World	(3)	
HST 4201		American History 1763–1848	(3)	
HST 4202		American History 1848–1917	(3)	
HST 4203		American History since 1917	(3)	
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	(6)	
POL 4103		Introduction to Politics	(3)	
POL 4104		Introduction to American Government	(3)	
POL 4105		Introduction to Comparative Politics	(3)	
POL 4300	POL 4301	Public Administration 1, 2	(6)	
POL 4310		American Political Thought	(3)	
POL 4312		Political Parties and Pressure Groups	(3)	
POL 4320		American Constitutional Law	(3)	
POL 4321		Civil Liberties	(3)	
POL 4322		Procedural Due Process	(3)	
POL 4335		Formulating American Foreign Policy	(3)	
POL 4375	POL 4376	POL 4377	Consumer Advocacy 1, 2, 3	(9)
PSY 4110		Fundamental Issues in Psychology	(3)	
PSY 4111		Developmental Aspects in Psychology	(3)	
PSY 4112		Personal Dynamics in Psychology	(3)	
PSY 4270	PSY 4271	Social Psychology 1, 2	(6)	
PSY 4372	PSY 4373	PSY 4374	Abnormal Psychology 1, 2, 3	(9)
SOC 4125		Social Problems	(3)	
SOC 4147		Urban Sociology	(3)	
SOC 4170		Race and Ethnic Relations	(3)	
SOC 4186		Social Control	(3)	

Total Quarter Hours**96**

Correctional Practices Bachelor of Science Degree (Major Code 944)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing I, 2	6
ENG 4112		Approaches to Literature	3
MTH 4110	MTH 4111	Mathematics I, 2	6
PSY 4110		Fundamental Issues in Psychology	3
PSY 4111		Developmental Aspects in Psychology	3
PSY 4112		Personal Dynamics in Psychology	3
SOC 4100		Fundamental Issues in Sociology	3
SOC 4101		The Individual and Social Roles	3
SOC 4102		Critical Issues Facing Society	3
PHL 4230		Ethics in Theory and Practice	3
PHL 4231		Current Topics in Ethics	3
HRM 4301		Organizational Behavior	3
HRM 4302		Introduction to Human Resources Management	3
SOC 4125		Social Problems	3
SOC 4186		Social Control	3

Major Concentration Courses

LEN 4112		The American Correctional System	3
LEN 4115	LEN 4116	Correctional Administration I, 2	6
LEN 4132	LEN 4133	Administration of Justice I, 2	6
LEN 4136	LEN 4137	Criminal Law I, 2	6
LEN 4300		Human Rights in Corrections	3
LEN 4302		Correctional Counseling	3
LEN 4305	LEN 4306	Advanced Correctional Practices I, 2	6
LEN 4312	LEN 4313	Treatment of Offenders I, 2	6
LEN 4315	LEN 4316	Criminology I, 2	6
LEN 4317	LEN 4318	Probation and Parole Practices I, 2	6

Electives**Law Enforcement**

Select 36 quarter hours from the following courses. Not more than 18 quarter hours of seminar courses may be elected to satisfy this requirement.

LEN 4120	LEN 4121	Juvenile Corrections I, 2	(6)
LEN 4126		Correctional Practices Seminar	(3)
LEN 4128		Victimology Seminar	(3)
LEN 4129		Criminal Behavior Seminar	(3)
LEN 4134	LEN 4135	Civil Law in Criminal Justice I, 2	(6)
LEN 4138	LEN 4139	Evidence and Court Procedure I, 2	(6)
LEN 4140	LEN 4141	Fire Investigation and Arson I, 2	(6)
LEN 4308		Comparative Correctional Systems	(3)
LEN 4335		Organized Crime Seminar	(3)
LEN 4899		Field Work in Law Enforcement, Correctional Practices, and Security	(6)

Continued

Other Electives*Select 36 quarter hours from the following:*

ASL 4101	ASL 4102		American Sign Language 1, 2	(8)
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	(9)
HST 4101			The Civilization of the Ancient and Medieval Worlds	(3)
HST 4102			The Civilization of the Early Modern World	(3)
HST 4103			The Civilization of the Modern World	(3)
HST 4201			American History 1763–1848	(3)
HST 4202			American History 1848–1917	(3)
HST 4203			American History since 1917	(3)
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems 1, 2	(6)
POL 4103			Introduction to Politics	(3)
POL 4104			Introduction to American Government	(3)
POL 4105			Introduction to Comparative Politics	(3)
POL 4300	POL 4301		Public Administration 1, 2	(6)
POL 4310			American Political Thought	(3)
POL 4312			Political Parties and Pressure Groups	(3)
POL 4320			American Constitutional Law	(3)
POL 4321			Civil Liberties	(3)
POL 4322			Procedural Due Process	(3)
POL 4335			Formulating American Foreign Policy	(3)
POL 4375	POL 4376	POL 4377	Consumer Advocacy 1, 2, 3	(9)
PSY 4270	PSY 4271		Social Psychology 1, 2	(6)
PSY 4372	PSY 4373	PSY 4374	Abnormal Psychology 1, 2, 3	(9)
SOA 4100			Physical Anthropology	(3)
SOA 4101			Cultural Anthropology: Preliterate Societies	(3)
SOA 4102			Cultural Anthropology: Industrial Societies	(3)
SOC 4147			Urban Sociology	(3)
SOC 4170			Race and Ethnic Relations	(3)
SOC 4245			Sociology of Inequality	(3)

Total Quarter Hours**174**

Law Enforcement Associate in Science Degree (Major Code 941)**Core Courses**

			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
PSY 4110		Fundamental Issues in Psychology	3
PSY 4111		Developmental Aspects in Psychology	3
PSY 4112		Personal Dynamics in Psychology	3
PHL 4230		Ethics in Theory and Practice	3
PHL 4231		Current Topics in Ethics	3

Major Concentration Courses

LEN 4100	LEN 4101	Criminal Investigation and Case Preparation 1, 2	6
LEN 4110	LEN 4111	Introduction to Criminalistics 1, 2	6
LEN 4132	LEN 4133	Administration of Justice 1, 2	6
LEN 4136	LEN 4137	Criminal Law 1, 2	6
LEN 4315	LEN 4316	Criminology 1, 2	6

Electives**Law Enforcement**

Select 24 quarter hours from the following courses. Not more than 6 quarter hours of seminar courses may be elected to satisfy this requirement.

LEN 4107		Police-Community Relations	(3)
LEN 4108	LEN 4109	The Patrol Function 1, 2	(6)
LEN 4118		Police Work with Juveniles	(3)
LEN 4128		Victimology Seminar	(3)
LEN 4129		Criminal Behavior Seminar	(3)
LEN 4134	LEN 4135	Civil Law in Criminal Justice 1, 2	(6)
LEN 4138	LEN 4139	Evidence and Court Procedure 1, 2	(6)
LEN 4140	LEN 4141	Fire Investigation and Arson 1, 2	(6)
LEN 4311		Research Methods in Criminal Justice	(3)
LEN 4314		Police Supervision	(3)
LEN 4899		Field Work in Law Enforcement, Correctional Practices, and Security	(6)

Continued

Other Electives*Select 18 quarter hours from the following:*

Select 10 quarter hours from the following			
ASL 4101	ASL 4102	American Sign Language 1, 2	(8)
HST 4101		The Civilization of the Ancient and Medieval Worlds	(3)
HST 4102		The Civilization of the Early Modern World	(3)
HST 4103		The Civilization of the Modern World	(3)
HST 4201		American History 1763–1848	(3)
HST 4202		American History 1848–1917	(3)
HST 4203		American History since 1917	(3)
HRM 4301		Organizational Behavior	(3)
HRM 4302		Introduction to Human Resources Management	(3)
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	(6)
POL 4103		Introduction to Politics	(3)
POL 4104		Introduction to American Government	(3)
POL 4105		Introduction to Comparative Politics	(3)
POL 4300	POL 4301	Public Administration 1, 2	(6)
POL 4310		American Political Thought	(3)
POL 4312		Political Parties and Pressure Groups	(3)
POL 4320		American Constitutional Law	(3)
POL 4321		Civil Liberties	(3)
POL 4322		Procedural Due Process	(3)
POL 4335		Formulating American Foreign Policy	(3)
POL 4375	POL 4376	POL 4377	Consumer Advocacy 1, 2, 3
PSY 4270	PSY 4271		Social Psychology 1, 2
PSY 4372	PSY 4373	PSY 4374	Abnormal Psychology 1, 2, 3
SOC 4100			Fundamental Issues in Sociology
SOC 4101			The Individual and Social Roles
SOC 4102			Critical Issues Facing Society
SOC 4186			Social Control
SPC 4251			Business and Professional Speaking

Total Quarter Hours**96**

Law Enforcement Bachelor of Science Degree (Major Code 940)**Core Courses**

quarter hours

ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics 1, 2	6
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3
SOC 4102			Critical Issues Facing Society	3
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PHL 4230			Ethics in Theory and Practice	3
PHL 4231			Current Topics in Ethics	3

Major Concentration Courses

LEN 4100	LEN 4101	Criminal Investigation and Case Preparation 1, 2	6
LEN 4110	LEN 4111	Introduction to Criminalistics 1, 2	6
LEN 4132	LEN 4133	Administration of Justice 1, 2	6
LEN 4136	LEN 4137	Criminal Law 1, 2	6
LEN 4315	LEN 4316	Criminology 1, 2	6
LEN 4319	LEN 4320	Law Enforcement Management and Planning 1, 2	6

Electives**Law Enforcement**

Select 42 quarter hours from the following courses. Not more than 18 quarter hours of seminar courses may be elected to satisfy this requirement.

LEN 4102		Comparative Police Systems	(3)
LEN 4107		Police-Community Relations	(3)
LEN 4108	LEN 4109	The Patrol Function 1, 2	(6)
LEN 4118		Police Work with Juveniles	(3)
LEN 4128		Victimology Seminar	(3)
LEN 4129		Criminal Behavior Seminar	(3)
LEN 4134	LEN 4135	Civil Law in Criminal Justice 1, 2	(6)
LEN 4138	LEN 4139	Evidence and Court Procedure 1, 2	(6)
LEN 4140	LEN 4141	Fire Investigation and Arson 1, 2	(6)
LEN 4311		Research Methods in Criminal Justice	(3)
LEN 4314		Police Supervision	(3)
LEN 4335		Organized Crime Seminar	(3)
LEN 4338		Forensic Laboratory Seminar	(3)
LEN 4340	LEN 4341	Civil Liberties and the Police 1, 2	(6)
LEN 4899		Field Work in Law Enforcement, Correctional Practices, and Security	(6)

Continued

Other Electives*Select 48 quarter hours from the following:*

ASL 4101	ASL 4102		American Sign Language 1, 2	(8)
ECN 4140			Economics of Crime	(3)
HRM 4301			Organizational Behavior	(3)
HRM 4302			Introduction to Human Resources Management	(3)
POL 4103			Introduction to Politics	(3)
POL 4104			Introduction to American Government	(3)
POL 4105			Introduction to Comparative Politics	(3)
POL 4300	POL 4301		Public Administration 1, 2	(6)
POL 4310			American Political Thought	(3)
POL 4312			Political Parties and Pressure Groups	(3)
POL 4320			American Constitutional Law	(3)
POL 4321			Civil Liberties	(3)
POL 4322			Procedural Due Process	(3)
POL 4335			Formulating American Foreign Policy	(3)
POL 4375	POL 4376	POL 4377	Consumer Advocacy 1, 2, 3	(9)
PSY 4270	PSY 4271		Social Psychology 1, 2	(6)
PSY 4372	PSY 4373	PSY 4374	Abnormal Psychology 1, 2, 3	(9)
SOC 4125			Social Problems	(3)
SOC 4186			Social Control	(3)
SOC 4205			Law and Society	(3)
SPC 4251			Business and Professional Speaking	(3)

Total Quarter Hours**174**

Security Associate in Science Degree (Major Code 943)**Core Courses**

			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
SOC 4100		Fundamental Issues in Sociology	3
SOC 4101		The Individual and Social Roles	3
SOC 4102		Critical Issues Facing Society	3
MGT 4101	MGT 4102	Introduction to Business and Management 1, 2	6
POL 4320		American Constitutional Law	3

Major Concentration Courses

LEN 4100	LEN 4101	Criminal Investigation and Case Preparation 1, 2	6
LEN 4103		Introduction to Industrial Security	3
LEN 4132	LEN 4133	Administration of Justice 1, 2	6
LEN 4136	LEN 4137	Criminal Law 1, 2	6
LEN 4138	LEN 4139	Evidence and Court Procedure 1, 2	6
LEN 4144	LEN 4145	Security Administration 1, 2	6
LEN 4147		Legal Aspects of Security Operations	3
LEN 4315	LEN 4316	Criminology	6

Electives**Law Enforcement**

Select 15 quarter hours from the following courses. Not more than 9 quarter hours of seminar courses may be elected to satisfy this requirement.

LEN 4110	LEN 4111	Introduction to Criminalistics 1, 2	(6)
LEN 4122		Industrial Fire Prevention	(3)
LEN 4123		Retail Security	(3)
LEN 4127		Current Security Problems	(3)
LEN 4128		Victimology Seminar	(3)
LEN 4129		Criminal Behavior Seminar	(3)
LEN 4134	LEN 4135	Civil Law in Criminal Justice 1, 2	(6)
LEN 4140	LEN 4141	Fire Investigation and Arson 1, 2	(6)
LEN 4319	LEN 4320	Law Enforcement Management and Planning 1, 2	(6)
LEN 4322	LEN 4323	Physical Security 1, 2	(6)
LEN 4335		Organized Crime Seminar	(3)
LEN 4899		Field Work in Law Enforcement, Correctional Practices, and Security	(6)

Continued

Other Electives*Select 12 quarter hours from the following:*

ACC 4101	ACC 4102	Accounting Principles 1, 2	(6)	
ASL 4101	ASL 4102	American Sign Language 1, 2	(8)	
FI 4301		Principles of Finance	(3)	
HRM 4301		Organizational Behavior	(3)	
HRM 4302		Introduction to Human Resources Management	(3)	
HST 4101		The Civilization of the Ancient and Medieval Worlds	(3)	
HST 4102		The Civilization of the Early Modern World	(3)	
HST 4103		The Civilization of the Modern World	(3)	
HST 4201		American History 1763–1848	(3)	
HST 4202		American History 1848–1917	(3)	
HST 4203		American History since 1917	(3)	
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	(6)	
MIS 4360		Computer Privacy and Security	(3)	
PHL 4200		Logic	(3)	
PHL 4230		Ethics in Theory and Practice	(3)	
PHL 4231		Current Topics in Ethics	(3)	
POL 4103		Introduction to Politics	(3)	
POL 4104		Introduction to American Government	(3)	
POL 4105		Introduction to Comparative Politics	(3)	
POL 4300	POL 4301	Public Administration 1, 2	(6)	
POL 4310		American Political Thought	(3)	
POL 4312		Political Parties and Pressure Groups	(3)	
POL 4321		Civil Liberties	(3)	
POL 4322		Procedural Due Process	(3)	
POL 4375	POL 4376	POL 4377	Consumer Advocacy 1, 2, 3	(9)
PSY 4110		Fundamental Issues in Psychology	(3)	
PSY 4111		Developmental Aspects in Psychology	(3)	
PSY 4112		Personal Dynamics in Psychology	(3)	
PSY 4390	PSY 4391	PSY 4392	Industrial Psychology 1, 2, 3	(9)
SPC 4251		Business and Professional Speaking	(3)	

Total Quarter Hours**96**

Security Bachelor of Science Degree (Major Code 942)**Core Courses**

quarter hours

ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
MTH 4110	MTH 4111		Mathematics 1, 2	6
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3
SOC 4102			Critical Issues Facing Society	3
MGT 4101	MGT 4102		Introduction to Business and Management 1, 2	6
POL 4320			American Constitutional Law	3

Major Concentration Courses

LEN 4100	LEN 4101	Criminal Investigation and Case Preparation 1, 2	6
LEN 4103		Introduction to Industrial Security	3
LEN 4132	LEN 4133	Administration of Justice 1, 2	6
LEN 4136	LEN 4137	Criminal Law 1, 2	6
LEN 4138	LEN 4139	Evidence and Court Procedure 1, 2	6
LEN 4144	LEN 4145	Security Administration 1, 2	6
LEN 4147		Legal Aspects of Security Operations	3
LEN 4315	LEN 4316	Criminology 1, 2	6
LEN 4322	LEN 4323	Physical Security 1, 2	6

Electives**Law Enforcement**

Select 39 quarter hours from the following courses. Not more than 18 quarter hours of seminar courses may be elected to satisfy this requirement.

LEN 4110	LEN 4111	Introduction to Criminalistics 1, 2	(6)
LEN 4122		Industrial Fire Prevention	(3)
LEN 4123		Retail Security	(3)
LEN 4127		Current Security Problems	(3)
LEN 4128		Victimology Seminar	(3)
LEN 4129		Criminal Behavior Seminar	(3)
LEN 4134	LEN 4135	Civil Law in Criminal Justice 1, 2	(6)
LEN 4140	LEN 4141	Fire Investigation and Arson 1, 2	(6)
LEN 4311		Research Methods in Criminal Justice	(3)
LEN 4319	LEN 4320	Law Enforcement Management and Planning 1, 2	(6)
LEN 4335		Organized Crime Seminar	(3)
LEN 4899		Field Work in Law Enforcement, Correctional Practices, and Security	(6)

Continued

Other Electives*Select 36 quarter hours from the following:*

ASL 4101	ASL 4102		American Sign Language 1, 2	(8)
FI 4301			Principles of Finance	(3)
HRM 4301			Organizational Behavior	(3)
HRM 4302			Introduction to Human Resources Management	(3)
HST 4101			The Civilization of the Ancient and Medieval Worlds	(3)
HST 4102			The Civilization of the Early Modern World	(3)
HST 4103			The Civilization of the Modern World	(3)
HST 4201			American History 1763-1848	(3)
HST 4202			American History 1848-1917	(3)
HST 4203			American History since 1917	(3)
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems 1, 2	(6)
MIS 4360			Computer Privacy and Security	(3)
PHL 4200			Logic	(3)
PHL 4230			Ethics in Theory and Practice	(3)
PHL 4231			Current Topics in Ethics	(3)
POL 4103			Introduction to Politics	(3)
POL 4104			Introduction to American Government	(3)
POL 4105			Introduction to Comparative Politics	(3)
POL 4300	POL 4301		Public Administration 1, 2	(6)
POL 4310			American Political Thought	(3)
POL 4312			Political Parties and Pressure Groups	(3)
POL 4321			Civil Liberties	(3)
POL 4322			Procedural Due Process	(3)
POL 4375	POL 4376	POL 4377	Consumer Advocacy 1, 2, 3	(9)
PSY 4390	PSY 4391	PSY 4392	Industrial Psychology 1, 2, 3	(9)
SPC 4251			Business and Professional Speaking	(3)

Total Quarter Hours**174**

Liberal Arts Degree Programs

Marilyn Wiener, *Associate Dean
Director, Liberal Arts Programs*

Judith Stoessel, *Assistant to the Director
Liberal Arts Programs*

266 Ruggles Building
617-437-2416

Purpose

Intellectual growth—the development of the ability to think independently and creatively—rests upon the foundation of a sound general education. Through the liberal arts curricula, University College students are guided toward an appreciative understanding of the active discovery of ideas and methods in the areas of humanities, natural science, and social science. With this training, the student can more fully realize the basic values upon which civilization rests and can more fully participate in the intellectual, moral, and material achievement of that civilization.

University College holds that there is no inconsistency between a truly liberal education and preparation for a vocation. As an adventure in intellectual discovery, a liberal education leads to a broadening and intensification of interests as the student becomes aware of his or her own mental strengths and weaknesses. This discovery is essential for making more intelligent and realistic appraisals of self and career. A career brings meaning and focus to the educational experience. Education presents both a challenge to accept responsibility and an opportunity to seek knowledge and skills.

Programs

Both Bachelor of Arts and Bachelor of Science degrees are offered in art, English, history, music, political science, psychology, and sociology-anthropology. Unlike the Bachelor of Science degree, the Bachelor of Arts degree includes a language requirement. Bachelor of Science degrees more directly linked to the modern workplace are offered in graphic design and visual communication, economics, and technical communications; the technical communications degree includes a professional experience program. In addition, degree programs in English, political science, and sociology-anthropology offer professional concentrations designed to cover specialized skills and help create new career options for liberal arts students.

Bachelor of Arts in Liberal Studies Degree

Consistent with its aim to provide students with a sound liberal education, University College offers a Bachelor of Arts in Liberal Studies degree. Designed to help students develop communication, analytical, and research skills while exploring the great ideas of the ages and the issues facing modern times, the program's courses are grouped in four areas:

- Communication and Critical Thinking
- Cultural Heritage
- Science, Research, and Quantitative Methods
- Contemporary Studies

The courses in each area are selected to provide students with both a broad knowledge base and a depth of perception resulting from viewing several subjects from different disciplinary perspectives.

In addition, 45 quarter hours of elective credits are provided to allow students to take a certificate program or select individual courses in accordance with their personal and career interests.

Upon approaching completion of individual course work in Cultural Heritage and Contemporary Studies, students take an interdisciplinary seminar in each area to integrate their learning experiences.

Bachelor's Degree in Graphic Design and Visual Communication

In response to the rising demand for professional training in the field of visual communication, University College is introducing a Bachelor of Science degree program in graphic design and communication.

The program has a unique, three-tiered structure, enabling students to begin with the certificate program, continue through the associate's program, and finish with the bachelor's program.

Business Administration Minor

Liberal arts bachelor's degree candidates have the option of completing a minor in business administration. Students who wish to earn a minor in business administration must use some of the open electives permitted in their degree programs for this purpose and should meet with an academic advisor from the Office of Academic and Student Affairs to identify the appropriate courses. These students are permitted to accumulate up to 44 quarter hours (25 percent of the credits toward a bachelor's degree) in business subjects. Business credits accumulated beyond this limit cannot be used to fulfill the graduation requirements for a Bachelor of Science degree in a liberal arts area.

Associate in Science Degree

An Associate in Science degree program in arts and sciences is offered for those who want a general cultural background in liberal arts, but who do not want to pursue a major field of concentration for the bachelor's degree.

Certificate Programs

Students who seek specialized skills to advance their careers may choose from among the following humanities certificate programs, which may be taken independently or in conjunction with degree study: advertising and public relations, American sign language and deaf studies, American studies, gerontology, graphic design and visual communication, public administration, sign language interpreting, software technical writing, song writing, speech communication, and writing.

Directed Study

Students may be eligible to enroll in a maximum of two directed study courses in a liberal arts major. The directed study is intended primarily for the senior who is unable to take a course needed for graduation because of circumstances beyond his or her control (for example, the course was not available during the student's tenure in University College). Such students should contact the program office to obtain an application. Please refer to course descriptions for more detailed information.

Honors Program

An upperclass honors program enables superior students to pursue studies in their major fields in greater depth than is possible in the regular classes.

The nature of the program is determined by the department concerned. Programs may involve special research projects culminating in honor theses, seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration given to the individual needs and requirements of the student. Honors advisors are chosen from the faculty of the department concerned.

Students who have earned 96 quarter hours of credit toward their bachelor's degree and who have a grade-point average of 3.0 or better are eligible to apply to the Director of Liberal Arts for admission to the program.

Field Work Courses

To provide the opportunity for students to apply their academic background to practical problems, the history, psychology, and sociology departments offer 6 quarter-hour courses in their curricula entitled "Field Work in...." Please refer to course descriptions for details. Guidelines are available from the Liberal Arts Program office.

Credit for Noncollegiate Experience (NCE)

Liberal arts degree candidates may obtain up to 16 quarter hours of noncollegiate experience credit (NCE) in all liberal arts areas except graphics, technical communications, and modern languages.

Whenever possible, NCE should be used as a substitute for specific liberal arts courses (for example, substituting NCE in Public Speaking for SPC 4251). When a specific course is deemed critical to the academic soundness of the major, a student may be asked to take the course but may, in addition, receive NCE credit in the subject area in which he or she has acquired special knowledge.

To apply for NCE credit, a student must file a petition listing the relevant courses and reasons for which credit should be received. He or she should also attach any materials that might serve as documentation.

Notification of acceptance or rejection of the petition is issued by the Office of Academic and Student Affairs, as directed by the Director of Liberal Arts, with the advice of the concerned departmental consultant(s). The latter determines whether the petitioner's NCE is equivalent to the course listings as claimed. Criteria for such evaluation may or may not include a formal examination, an interview, departmental consultation, or a request for additional documentation.

If positive action is taken on the petition, the resulting NCE credits may be applied toward a bachelor's degree. However, students should be aware of certain constraints. To have NCE credit counted to qualify for a given June graduation, the petition must be filed at least six months prior to the commencement date. NCE cannot be used to fulfill residence requirements. NCE credit cannot be given for courses that can be accredited through the CLEP testing program at the time of the petition. Grades are not assigned to NCE credits. It is possible that NCE credit may be applicable toward a degree in University College only.

Program Consultants and Advisers

ART: Arts (Arts, or Media and Graphic Communication)

Consultant/Program Adviser:

Prof. Samuel S. Bishop, Art Dept.

(College of Arts and Sciences) (437-2347)

Associate Coordinator: John Moore (782-3972)

ASL: American Sign Language

Consultant: Cathy Cogen, Director, ASL Program (College of Arts and Sciences) (voice 437-3064; TTY 437-3067)

Program Adviser: Nancy V. Becker, Coordinator, Educational Services, ASL Program (College of Arts and Sciences) (voice 437-3064; TTY 437-3067)

DRA: Theatre Arts

Consultant: Prof. Ingrid H. Sonnichsen, Drama Dept. (College of Arts and Sciences) (437-2244)

ECN: Economics

Consultant: Prof. M. A. Horowitz, Chairman, Economics Dept. (College of Arts and Sciences) (437-2882)

Associate Consultant: Prof. H. Goldstein, Executive Officer, Economics Dept. (College of Arts and Sciences) (437-2882)

Assistant Consultant/Program Adviser: Herbert J. Eskot, Economics Dept. (College of Arts and Sciences) (437-2882)

ENG: English (Literature or Writing)

Consultant: Prof. M. X. Lesser, English Dept. (College of Arts and Sciences) (437-2512)

Program Adviser: Wallace Coyle (U. Mass./Boston) (922-8141)

HST: History

Consultant: Prof. Raymond H. Robinson, Chairman, History Dept. (College of Arts and Sciences) (437-2660)

Coordinator of Western Civilization and Program Adviser: Prof. Gerald H. Herman, History Dept. (College of Arts and Sciences) (437-2660)

JRN: Journalism, Public Relations, or Advertising

Consultant: Prof. Larue W. Gilleland, Chairman, Journalism Dept. (College of Arts and Sciences) (437-3236)

LIB: Library Systems

Consultant: Frank Seegeraber (Boston College) (552-8000)

LN: Modern Languages

Consultant: Prof. Holbrook Robinson, Chairman, Modern Languages Dept. (College of Arts and Sciences) (437-2234)

Modern Languages includes the following:

LNA: Arabic	LNJ: Japanese
LNF: French	LNL: Latin
LNG: German	LNN: Swedish
LNH: Hebrew	LNS: Spanish
LNI: Italian	

MUS: Music

Consultant: Prof. Joshua R. Jacobson, Music Dept. (College of Arts and Sciences) (437-2240)

Program Adviser/Tutorial Coordinator: Charles Mokotoff (437-2240)

PHL: Philosophy and Religion

Consultant: Prof. E. Hacker, Philosophy Dept. (College of Arts and Sciences) (437-3636)

POL: Political Science

Consultant: Prof. L. Gerald Bursey, Political Science Dept. (College of Arts and Sciences) (437-2796)

Program Adviser: Prof. Robert Gilbert, Chairman, Political Science Dept. (College of Arts and Sciences) (437-2796)

PSY: Psychology

Consultant/Program Adviser: Prof. Charles Karis, Psychology Dept. (College of Arts and Sciences) (437-3076)

Associate Consultant: Prof. Harold Zamansky, Psychology Dept. (College of Arts and Sciences) (437-3076)

SOA: Anthropology and SOC: Sociology

Consultant: Prof. Eva C. Havas, Sociology Dept. (College of Arts and Sciences) (437-2686)

Program Adviser/Associate Consultant: Prof. Elliot Krause, Sociology Dept. (College of Arts and Sciences) (437-2686)

SPC: Speech Communication

Consultant: Prof. Michael L. Woodnick, Speech Communications Dept. (College of Arts and Sciences) (437-5517)

TCC: Technical Communications

Consultant: Neil F. Duane (Boston Documentation Design) (965-5300)

Arts and Sciences Associate in Science Degree (Major Code 372)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Major Concentration Courses			
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, MUS, PHL, SPC, TCC)			24
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)			18
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)			24
Electives			21
Total Quarter Hours			96

Economics Bachelor of Arts Degree (Major Code 390)

Core Courses			quarter hours	
ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
Modern Language		Elementary or Conversational	12	
		Intermediate	12	
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LNA to LNS, MUS, PHL, SPC, TCC)			24	
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)			18	
Social Sciences (HST, POL, PSY, SOA, SOC)			18	
Major Concentration Courses				
ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
ECN 4250	ECN 4251	ECN 4252	Statistics 1, 2, 3	9
ECN 4310			Labor Economics	3
ECN 4342	ECN 4343		Money and Banking 1, 2	6
ECN 4344			Government Finance	3
Electives				
Economics (Advanced)			27	
Open Electives			24	
Total Quarter Hours			174	

Economics**Bachelor of Science Degree with Certificate in Finance (Major Code 390)****Core Courses**

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Social Sciences (HST, POL, PSY, SOA, SOC)			18

Major Concentration Courses

ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems 1, 2, 3	9
ECN 4215			Macroeconomic Theory	3
ECN 4216			Microeconomic Theory	3
ECN 4250	ECN 4251	ECN 4252	Statistics 1, 2, 3	9
ECN 4310			Labor Economics	3
ECN 4342	ECN 4343		Money and Banking 1, 2	6
ECN 4344			Government Finance	3

Finance Certificate Courses

ACC 4101	ACC 4102	ACC 4103	Accounting Principles 1, 2, 3	9
FI 4301			Principles of Finance	3
FI 4302			Financial Management	3
FI 4310			Investment Principles	3
FI 4320			Credit Principles	3
FI 4325			Budgeting and Planning	3

Electives

Economics (Advanced)	21
Liberal Arts	42
Open Electives	24

Total Quarter Hours**174**

English Bachelor of Arts Degree (Major Code 330)

Core Courses		quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2
ENG 4112		Approaches to Literature
Modern Language		Elementary or Conversational
		Intermediate
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)		18
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)		24

Major Concentration Courses

ENG 4120		English Literature: Faith and Humanism	3
ENG 4121		English Literature: Reason and Romanticism	3
ENG 4122		English Literature: Victorians and Moderns	3
ENG 4123		Early American Literature: Faith, Reason, and Nature	3
ENG 4124		American Romantics and American Realists	3
ENG 4125		American Literature: The Modern Temper	3
ENG 4131		God, Gods, and Heroes: The Literature of the Ancient and Medieval Worlds	3
ENG 4132		Man, Reason, and Imagination: Literature from the Renaissance to the Romantic Age	3
ENG 4133		Order and Disorder: Literature of the Moderns	3
ENG 4349	ENG 4350	Expository and Persuasive Writing 1, 2	6
ENG 4352		Expository Communications	3
ENG 4602		Major Figures in Poetry	3
ENG 4603		Major Figures in Fiction	3
ENG 4658		Shakespeare the Dramatist	3

Select one of two concentrations for 27 quarter hours:

I. Literature

Select nine courses from the ENG 4200 or ENG 4600 series in the course descriptions on pages 134–136.

II. Writing

Select six courses from the ENG 4300 or ENG 4500 series in the course descriptions on pages 135–136, and three courses from either the JRN or TCC courses on pages 148–149 and 182–183.

Electives

English	9
Open Electives	18

Total Quarter Hours	174
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English Bachelor of Science Degree (Major Code 330)

Core Courses		quarter hours
ENG 4110	ENG 4111	Critical Writing I, 2
ENG 4112		Approaches to Literature
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)		18
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)		24

Major Concentration Courses

ENG 4120	English Literature: Faith and Humanism	3
ENG 4121	English Literature: Reason and Romanticism	3
ENG 4122	English Literature: Victorians and Moderns	3
ENG 4123	Early American Literature: Faith, Reason, and Nature	3
ENG 4124	American Romantics and American Realists	3
ENG 4125	American Literature: The Modern Temper	3
ENG 4131	God, Gods, and Heroes: The Literature of the Ancient and Medieval Worlds	3
ENG 4132	Man, Reason, and Imagination: Literature from the Renaissance to the Romantic Age	3
ENG 4133	Order and Disorder: Literature of the Moderns	3
ENG 4349	ENG 4350	Expository and Persuasive Writing I, 2
ENG 4352		Expository Communications
ENG 4602		Major Figures in Poetry
ENG 4603		Major Figures in Fiction
ENG 4658		Shakespeare the Dramatist

Select one of two concentrations for 27 quarter hours:

I. Literature

Select nine courses from the ENG 4200 or ENG 4600 series in the course descriptions on pages 134–136.

II. Writing

Select six courses from the ENG 4300 or ENG 4500 series in the course descriptions on pages 135–136, and three courses from either the JRN or TCC courses on pages 148–149 and 182–183.

Electives

English	9
Open Electives	42

Total Quarter Hours**174**

Fine Arts Bachelor of Arts Degree (Major Code 327)

Core Courses		quarter hours
ENG 4110	ENG 4111	Critical Writing I, 2
ENG 4112		Approaches to Literature
Modern Language		Elementary or Conversational
		Intermediate
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)		
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)		
Major Concentration Courses		
ART 4100		History of Art
ART 4101		History of Art to the Sixteenth Century
ART 4102		History of Art to the Twentieth Century
ART 4106		Introduction to Art
Electives		
Art		
Open Electives		
Total Quarter Hours		174

Fine Arts Bachelor of Science Degree (Major Code 327)

Core Courses		quarter hours
ENG 4110	ENG 4111	Critical Writing I, 2
ENG 4112		Approaches to Literature
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)		
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)		
Major Concentration Courses		
ART 4100		History of Art
ART 4101		History of Art to the Sixteenth Century
ART 4102		History of Art to the Twentieth Century
ART 4106		Introduction to Art
Electives		
Art		
Open Electives		
Total Quarter Hours		174

Graphic Design and Visual Communication Associate in Science Degree (Major Code 362)

Core Courses quarter hours

Communication

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
PHL 4100		Philosophical Thinking	3
SPC 4101		Fundamentals of Human Communication	3

Social Sciences

HST 4101		The Civilization of the Ancient and Medieval Worlds	3
HST 4102		The Civilization of the Early Modern World	3
HST 4103		The Civilization of the Modern World	3
SOC 4100		Fundamental Issues in Sociology	3
SOC 4101		The Individual and Social Roles	3

Business

MGT 4101		Introduction to Business and Management I	3
MKT 4301		Introduction to Marketing I	3
ACC 4101		Accounting Principles I	3

Major Concentration Courses

Art/Graphics

ART 4105		Art through the Ages	3
ART 4110		Modern Art	3
ART 4121		Principles of Drawing and Composition	3
ART 4122		Introduction to Figure Drawing	3
ART 4133		Basic Color and Design	3
ART 4175		History of Graphic Design	3

Graphic Design and Communication Certificate

ART 4140		Graphic Communication and Production	3
JRN 4349		Advertising Basics	3
ART 4150		Graphic Design: Tools and Techniques	3
ART 4151		Typography	3
ART 4141	ART 4142	Graphic Design 1, 2	6
ART 4143		Advertising Design	3
ART 4366		Promotional and Technical Publications: Design and Production	3
ART 4251		Advanced Graphic Design	3

Electives

Additional courses in humanities are recommended. 12

Total Quarter Hours **96**

Graphic Design and Visual Communication Associate in Science Degree (Major Code 362)

	quarter hours
Credits from Associate in Science degree in graphic design and communication	96

Core Courses

Business Communication and Research

ENG 4380	ENG 4381	Business Writing and Reports 1, 2	6
LIB 4325		Business Research Tools	3
SPC 4251		Business and Professional Speaking	3
ECN 4115		Economic Principles and Problems I	3
MGT 4324		Essentials for Managers of Small Businesses	2

Computer, Math, Science

COM 4101		Foundations of Computer Literacy	3
MTH 4110	MTH 4111	MTH 4112	Mathematics 1, 2, 3

Select one of the following pairs:

BIO 4103	BIO 4104	Biology 1, 2	(6)
or		or	
CHM 4111	CHM 4112	General Chemistry 1, 2	(6)
or		or	
ESC 4100	ESC 4101	Earth Science 1, 2	(6)
or		or	
PHY 4104	PHY 4105	General Physics 1, 2	(6)

Major Concentration Courses

ART 4176	International Directions in Design	3
ART 4160	Basic Photography	3
ART 4367	Illustration	3
ART 4368	Graphic Design for Media	3
ART 4181	Introduction to Computer-Aided Graphic Design	3
ART 4182	Computer-Aided Graphic Design Workshop	3
ART 4183	Electronic Imaging Systems Practicum	3
ART 4500	Senior Project	4
ART 4501	Portfolio Development	3

Electives

Physics and additional courses in humanities are recommended.	13–15
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Total Quarter Hours

174–176

History Bachelor of Arts Degree (Major Code 323)

Core Courses

			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Modern Language		Elementary or Conversational	12
		Intermediate	12
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, MUS, PHL, SPC, TCC)			24
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)			18
Social Sciences (in three of the following areas: ECN, POL, PSY, SOA, SOC)			18

Major Concentration Courses

HST 4101	The Civilization of the Ancient and Medieval Worlds	3
HST 4102	The Civilization of the Early Modern World	3
HST 4103	The Civilization of the Modern World	3
HST 4201	American History 1763–1848	3
HST 4202	American History 1848–1917	3
HST 4203	American History since 1917	3
HST 4241	The Historian's Craft	3
HST 4304	History of Energy	3
HST 4407	Ancient Greece	3
HST 4425	Europe since 1921	3
HST 4443	European Intellectual History since 1815	3
HST 4502	Colonial America	3
HST 4540	American Social History	3
HST 4611	Africa since 1885	3
HST 4632	China since 1850	3

Electives		36
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Total Quarter Hours		174
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History Bachelor of Science Degree (Major Code 323)**Core Courses**

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6	
ENG 4112		Approaches to Literature	3	
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	6	
SOC 4321	SOC 4322	SOC 4323	Social Research Methods 1, 2, 3	12
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, MUS, PHL, SPC, TCC)				24
Social Sciences				18

Select two sequences of three courses from the following:

ECN 4115	ECN 4116	ECN 4117	Economic Principles and Problems I, 2, 3	(9)
POL 4103			Introduction to Politics	(3)
POL 4104			Introduction to American Government	(3)
POL 4105			Introduction to Comparative Politics	(3)
PSY 4110			Fundamental Issues in Psychology	(3)
PSY 4111			Developmental Aspects in Psychology	(3)
PSY 4112			Personal Dynamics in Psychology	(3)
SOA 4100			Physical Anthropology	(3)
SOA 4101			Cultural Anthropology: Preliterary Societies	(3)
SOA 4102			Cultural Anthropology: Industrial Societies	(3)
SOC 4100			Fundamental Issues in Sociology	(3)
SOC 4101			The Individual and Social Roles	(3)
SOC 4102			Critical Issues Facing Society	(3)

Major Concentration Courses

HST 4101	The Civilization of the Ancient and Medieval Worlds	3
HST 4102	The Civilization of the Early Modern World	3
HST 4103	The Civilization of the Modern World	3
HST 4201	American History 1764–1848	3
HST 4202	American History 1848–1917	3
HST 4203	American History since 1917	3

Continued

Major Concentration Courses (Cont.)

HST 4241	The Historian's Craft	3
HST 4301	Technological Transformation of Society	3
HST 4304	History of Energy	3
HST 4407	Ancient Greece	3
HST 4425	Europe since 1921	3
HST 4265	Introduction to Public History	3
HST 4443	European Intellectual History since 1815	3
HST 4502	Colonial America	3
HST 4530	American Economic History	3
HST 4540	American Social History	3
HST 4611	Africa since 1885	3
HST 4632	China since 1850	3

Electives (preferably other than history)	51
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Total Quarter Hours	174
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Bachelor of Arts in Liberal Studies Degree (Major Code 495)**Core Courses**

quarter hours

Communication and Critical Thinking

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
INT 4200		The Creative Process	3
PHL 4100		Philosophical Thinking	3
PHL 4105		Philosophy of Knowing and Reality	3
PHL 4200		Logic	3
SPC 4101	SPC 4102	Effective Communication 1, 2	6
SPC 4251		Business and Professional Speaking	3

Cultural Heritage

ART 4105		Art through the Ages	3
ECN 4137		History of Economic Thought	3
ENG 4131		God, Gods, and Heroes: Literature of the Ancient and Medieval Worlds	3
ENG 4132		Man, Reason, and Imagination: Literature from the Renaissance to the Romantic Age	3
ENG 4133		Order and Disorder: Literature of the Moderns	3
HST 4101		The Civilization of the Ancient and Medieval Worlds	3
HST 4102		The Civilization of the Early Modern World	3
HST 4103		The Civilization of the Modern World	3
MUS 4120		History of Musical Styles	3
POL 4110		The Great Political Thinkers	3
INT 4201		Cultural Heritage Seminar	3

Science, Research, and Quantitative Methods

CHM 4105			Chemistry and the Environment	3
ECN 4250	ECN 4251		Statistics 1, 2	6
ESC 4650			History of Ancient Sciences and Technologies	3
ESC 4651			History of Modern Sciences and Technologies	3
LIB 4310			Critical Research Tools	3
MIS 4101	MIS 4102		Introduction to Data Processing and Information Systems 1, 2	6
MTH 4110	MTH 4111	MTH 4112	Mathematics 1, 2, 3	9

Continued

Contemporary Studies

ECN 4115	ECN 4116	Economic Principles and Problems 1, 2	6
ECN 4334		Comparative Economic Systems	3
POL 4105		Introduction to Comparative Politics	3
PSY 4110		Fundamental Issues in Psychology	3
PSY 4111		Developmental Aspects in Psychology	3
SOA 4155		Individual and Culture	3
SOC 4100		Fundamental Issues in Sociology	3
SOC 4101		The Individual and Social Roles	3
SOC 4102		Critical Issues Facing Society	3
INT 4202		Contemporary Studies Seminar	3

Electives 45

Electives may be used:

- to take a University College certificate program
- to study a modern language or other area in greater depth
- in areas of personal or career interest

Students are encouraged to make an appointment with a University College counselor for help in selecting electives. Call 617-437-2400 for an appointment.

Total Quarter Hours 174

Music Bachelor of Arts Degree (Major Code 328)

Core Courses				quarter hours
ENG 4110	ENG 4111		Critical Writing 1, 2	6
ENG 4112			Approaches to Literature	3
Modern Language			Elementary or Conversational	12
			Intermediate	12
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)				18
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)				24
Major Concentration Courses				
MUS 4120			History of Musical Styles	3
MUS 4121			Medieval and Renaissance Music	3
MUS 4122			Music of the Baroque	3
MUS 4123			Music History of the Classical Period	3
MUS 4124			Music History of the Romantic Era	3
MUS 4125			Music History of the Twentieth Century	3
MUS 4201	MUS 4202	MUS 4203	Music Theory 1, 2, 3	12
MUS 4241			Piano Class I	3
MUS 4254	MUS 4255	MUS 4256	Music Tutorial 1, 2, 3	9
MUS 4301			Form and Analysis	3
Electives				
Music				15
Open Electives				39
Total Quarter Hours				174

Music Bachelor of Science Degree (Major Code 328)**Core Courses**

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)			18
Social Sciences (ECN, HST, POL, PSY, SOA, SOC)			24

Major Concentration Courses

MUS 4120			History of Musical Styles	3
MUS 4121			Medieval and Renaissance Music	3
MUS 4122			Music of the Baroque	3
MUS 4123			Music History of the Classical Period	3
MUS 4124			Music History of the Romantic Era	3
MUS 4125			Music History of the Twentieth Century	3
MUS 4201	MUS 4202	MUS 4203	Music Theory 1, 2, 3	12
MUS 4241			Piano Class I	3
MUS 4254	MUS 4255	MUS 4256	Music Tutorial 1, 2, 3	9
MUS 4301			Form and Analysis	3

Electives

Music	15
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, PHL, SPC, TCC)	15
Open Electives	48

Total Quarter Hours**174**

Political Science Bachelor of Arts Degree (Major Code 322)

Core Courses		quarter hours
ENG 4110	ENG 4111	Critical Writing I, 2
ENG 4112		Approaches to Literature
Modern Language		Elementary or Conversational
		Intermediate
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, MUS, PHL, SPC, TCC)		24
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)		18
Social Sciences (in three of the following areas: ECN, HST, PSY, SOA, SOC)		18

Major Concentration Courses

POL 4103	Introduction to Politics	3
POL 4104	Introduction to American Government	3
POL 4105	Introduction to Comparative Politics	3
POL 4331	International Relations	3
POL 4370	Introduction to Political Theory	3

American Government*Select three of the following:*

POL 4310	American Political Thought	(3)
POL 4313	State and Local Government	(3)
POL 4314	Urban and Metropolitan Government	(3)
POL 4318	The American Presidency	(3)
POL 4319	The Legislative Process	(3)
POL 4320	American Constitutional Law	(3)
POL 4321	Civil Liberties	(3)
POL 4322	Procedural Due Process	(3)

Comparative Government*Select two of the following:*

POL 4330	Comparative Politics	(3)
POL 4338	European Political Parties	(3)
POL 4339	Government and Politics in the Soviet Union	(3)
POL 4342	Communism in Eastern Europe	(3)
POL 4350	Politics and Policies of the Developing Nations	(3)
POL 4352	Government and Politics of Latin America	(3)
POL 4356	Government and Politics of Northern Africa	(3)
POL 4357	Government and Politics of Sub-Saharan Africa	(3)
POL 4359	Government and Politics in the Middle East	(3)
POL 4362	Government and Politics of Southeast Asia	(3)
POL 4365	Government and Politics of China	(3)
POL 4367	Government and Politics of Japan	(3)

Continued

International Relations*Select one of the following:*

POL 4332	International Organization	(3)
POL 4333	International Law	(3)
POL 4335	Formulating American Foreign Policy	(3)
POL 4336	American Foreign Policy	(3)
POL 4341	Soviet Foreign Policy	(3)
POL 4364	China's Foreign Policy	(3)

Theory and Methodology

POL 4371	Contemporary Political Theory	(3)
or	or	
POL 4311	Research Methods	(3)

Electives

Political Science	18
Open Electives	27

Total Quarter Hours**174**

Political Science Bachelor of Science Degree (Major Code 322)**Core Courses**

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
ECN 4250	ECN 4251	ECN 4252	Statistics 1, 2, 3 (9)
or		or	
MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems 1, 2	(6)
and		and	
MIS 4220		Introduction to COBOL	(3)
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, MUS, PHL, SPC, TCC)			12
Social Sciences (in three of the following areas: ECN, HST, PSY, SOA, SOC)			18

Major Concentration Courses

POL 4103	Introduction to Politics	3
POL 4104	Introduction to American Government	3
POL 4105	Introduction to Comparative Politics	3
POL 4331	International Relations	3
POL 4370	Introduction to Political Theory	3

American Government*Select three of the following:*

POL 4310	American Political Thought	(3)
POL 4313	State and Local Government	(3)
POL 4314	Urban and Metropolitan Government	(3)
POL 4318	The American Presidency	(3)
POL 4319	The Legislative Process	(3)
POL 4320	American Constitutional Law	(3)
POL 4321	Civil Liberties	(3)
POL 4322	Procedural Due Process	(3)

Continued

Comparative Government*Select two of the following:*

POL 4330	Comparative Politics	(3)
POL 4338	European Political Parties	(3)
POL 4339	Government and Politics in the Soviet Union	(3)
POL 4342	Communism in Eastern Europe	(3)
POL 4350	Politics and Policies of the Developing Nations	(3)
POL 4352	Government and Politics of Latin America	(3)
POL 4356	Government and Politics of Northern Africa	(3)
POL 4357	Government and Politics of Sub-Saharan Africa	(3)
POL 4359	Government and Politics in the Middle East	(3)
POL 4362	Government and Politics of Southeast Asia	(3)
POL 4365	Government and Politics of China	(3)
POL 4367	Government and Politics of Japan	(3)

International Relations*Select one of the following:*

POL 4332	International Organization	(3)
POL 4333	International Law	(3)
POL 4335	Formulating American Foreign Policy	(3)
POL 4336	American Foreign Policy	(3)
POL 4341	Soviet Foreign Policy	(3)
POL 4364	China's Foreign Policy	(3)

Theory and Methodology

POL 4371	Contemporary Political Theory	(3)
or	or	
POL 4311	Research Methods	(3)

Electives

Political Science	18
Open Electives*	72

Total Quarter Hours**174**

*Students who elect the Public Administration Concentration have only 30 quarter hours of open electives.

Continued

Optional Public Administration Concentration
(open only to B.S. degree candidates)

			quarter hours
POL 4300	POL 4301	Public Administration I, 2	6
POL 4310		American Political Thought	3
POL 4311		Research Methods	3
<i>Select two of the following:</i>			
POL 4303		Public Personnel Administration	(3)
POL 4304		Public Budgeting	(3)
POL 4305		Organizational Theory	(3)
<i>Select seven of the following:</i>			
POL 4306		Public Policy Analysis	(3)
POL 4313		Government and Politics of the State	(3)
POL 4314		Urban Metropolitan Government	(3)
POL 4318		American Presidency	(3)
POL 4320		American Constitutional Law	(3)
POL 4321		Civil Liberties	(3)
POL 4322		Procedural Due Process	(3)
POL 4332		International Organization	(3)
POL 4375		Consumer Advocacy I	(3)
POL 4378		Current Political Issues	(3)
Political Science Elective			3
Total Quarter Hours			42

Psychology Bachelor of Arts Degree (Major Code 319)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Modern Language		Elementary or Conversational	12
		Intermediate	12
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, MUS, PHL, SPC, TCC)			24
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)			18
Social Sciences (in three of the following areas: ECN, HST, POL, SOA, SOC)			18
Major Concentration Courses			
PSY 4110		Fundamental Issues in Psychology	3
PSY 4111		Developmental Aspects of Psychology	3
PSY 4112		Personal Dynamics in Psychology	3
PSY 4220	PSY 4221	PSY 4222	Statistics in Psychology 1, 2, 3
PSY 4611		Senior Seminar	3
<i>Select three of the following pairs:</i>			
PSY 4231	PSY 4531	Psychology of Learning 1, 2 (Lab)	(6)
PSY 4272	PSY 4572	Personality 1, 2 (Lab)	(6)
PSY 4351	PSY 4551	Physiological Psychology 1, 2 (Lab)	(6)
PSY 4381	PSY 4581	Sensation and Perception 1, 2 (Lab)	(6)
Electives			
Psychology			21
Open Electives			21
Total Quarter Hours			174

Psychology Bachelor of Science Degree (Major Code 319)**Core Courses**

quarter hours

ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Math-Science (BIO, CHM, ESC, MTH, PHY)			30

Major Concentration Courses

PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
PSY 4220	PSY 4221	PSY 4222	Statistics in Psychology 1, 2, 3	9
PSY 4231	PSY 4531		Psychology of Learning 1, 2	6
PSY 4272	PSY 4572		Personality 1, 2	6
PSY 4351	PSY 4551		Physiological Psychology 1, 2	6
PSY 4381	PSY 4581		Sensation and Perception 1, 2	6
PSY 4611			Senior Seminar	3

Electives

Psychology	15
Open Electives	75

Total Quarter Hours**174**

Sociology-Anthropology Bachelor of Arts Degree (Major Code 321)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Modern Language		Elementary or Conversational	12
		Intermediate	12
Humanities (ART, ASL, DRA, ENG, JRN, LIB, LN, MUS, PHL, SPC, TCC)			24
Math-Science (BIO, CHM, ESC, MTH, PHY, PSY Labs)			18
Social Sciences (in three of the following areas: ECN, HST, POL, PSY)			18

Major Concentration Courses

SOA 4100			Physical Anthropology	3
SOA 4101			Cultural Anthropology: Preliterate Societies	3
SOA 4102			Cultural Anthropology: Industrial Societies	3
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3
SOC 4102			Critical Issues Facing Society	3
SOC 4300	SOC 4301	SOC 4302	Social Theory 1, 2, 3	9
SOC 4321	SOC 4322	SOC 4323	Social Research Methods 1, 2, 3	12

Electives

Sociology-Anthropology (at least 9 quarter hours in SOA)	21
Open Electives	21

Total Quarter Hours**174**

Sociology-Anthropology Bachelor of Science Degree (Major Code 321)

Core Courses			quarter hours
ENG 4110	ENG 4111	Critical Writing 1, 2	6
ENG 4112		Approaches to Literature	3
Social Sciences (ECN, HST, POL, PSY)			18

Major Concentration Courses

SOA 4100			Physical Anthropology	3
SOA 4101			Cultural Anthropology: Preliterate Societies	3
SOA 4102			Cultural Anthropology: Industrial Societies	3
SOC 4100			Fundamental Issues in Sociology	3
SOC 4101			The Individual and Social Roles	3
SOC 4102			Critical Issues Facing Society	3
SOC 4300	SOC 4301	SOC 4302	Social Theory 1, 2, 3	9
SOC 4321	SOC 4322	SOC 4323	Social Research Methods 1, 2, 3	12

Electives

Sociology-Anthropology (at least 9 quarter hours in SOA)	39
Open Electives (preferably in the humanities and math-science)*	69

Total Quarter Hours	174
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*Students who elect the Human Services concentration have only 40 quarter hours of open electives.

Human Services Elective Concentration (open only to B.S. degree candidates)

				quarter hours
SOC 4125			Social Problems	3
SOC 4240			Sociology of Human Service Organizations	3
SOC 4241			Human Service Professions	3
SOC 4245			Poverty and Inequality	3
SOC 4260	SOC 4261	SOC 4262	Introduction to Social Work Practice 1, 2, 3	9
PSY 4110			Fundamental Issues in Psychology	3
PSY 4111			Developmental Aspects in Psychology	3
PSY 4112			Personal Dynamics in Psychology	3
PSY 4372	PSY 4373	PSY 4374	Abnormal Psychology 1, 2, 3	9

Total Quarter Hours	39
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Continued

Recommended Electives for Human Services Concentration Students:

ECN 4130		Medical Economics	3
ECN 4311		Human Resource Planning	3
ECN 4315		Income Inequality and Discrimination	3
POL 4300	POL 4301	Public Administration 1, 2	6
POL 4306		Public Policy Analysis	3
POL 4321		Civil Liberties	3
PSY 4240		Development: Infancy and Childhood	3
PSY 4241		Development: Adolescence	3
PSY 4242		Development: Adulthood and Aging	3
PSY 4272		Personality I	3
SOC 4170		Race and Ethnic Relations	3
SOC 4185		Sociology of Deviant Behavior	3
SOC 4186		Social Control	3
SOC 4190		Juvenile Delinquency	3
SOC 4215		Medical Sociology	3
SOC 4220		Sociology of Mental Health	3
SOC 4225		Social Gerontology	3

Technical Communications Bachelor of Science Degree (Major Code 380)

quarter hours

Advanced Standing Credit, including ENG 4110, ENG 4111, ENG 4112 or their equivalents 82**Core Courses****Basic Communication**

ART 4140		Graphic Communication and Production	3
PHL 4100		Philosophical Thinking	3
PHL 4200		Logic	3
ENG 4349	ENG 4350	Expository and Persuasive Writing I, 2	6
JRN 4112		Fundamentals of Newswriting	3
LIB 4325		Business Research Tools	3
SPC 4152		Interviewing	3

Technology

MIS 4101	MIS 4102	Introduction to Data Processing and Information Systems I, 2	6
MTH 4081	MTH 4082	Introduction to Math I, 2	8
MTH 4083		Applied Math and Statistics	3
TCC 4350	TCC 4351	Concepts of Modern Technology I, 2	6
TCC 4353		Modern Electronics	3

Select one of the following:

MIS 4220		Introduction to Programming in COBOL	(3)
MIS 4240		Introduction to Programming in BASIC	(3)
MIS 4250		FORTRAN Programming I	(3)
MIS 4270		PASCAL Programming I	(3)

Major Concentration Courses

TCC 4101	TCC 4102	Technical Writing I, 2	6
TCC 4105		Editing for Science and Technology	3

Select four of the following:

TCC 4110		Technical Promotional Writing	(3)
TCC 4301	TCC 4302	Computer Software Technical Writing I, 2	(6)
TCC 4311	TCC 4312	Instruction Manual Writing I, 2	(6)
TCC 4320		Proposal Writing	(3)
TCC 4330		The Business and Technical Presentation	(3)

Professional Experience Program

An option for eligible students; call 617-437-2428 for details.

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Continued

Electives

12

The following electives are recommended:

ACC 4101	ACC 4102	Accounting Principles I, 2	(6)
ART 4366		Promotional and Technical Publications: Design and Production	(3)
ENG 4352		Expository Communications	(3)
MGT 4101	MGT 4102	Introduction to Business and Management I, 2	(6)

Total Quarter Hours**174**

Program for Alternative Freshmen

Program Goals

Students in the Alternative Freshman-Year Program are considered regular students and are degree candidates with an undeclared major. The Alternative Freshman-Year Program is specifically designed to help students strengthen their basic academic skills in writing and mathematics. While helping them gain confidence in their ability to do college-level work, the program also offers students an opportunity to consider several different areas of study before committing themselves to a specific major. Through the combination of a carefully prescribed curriculum and the attention of professional counselors, each student is helped to establish a program suited to his or her individual needs. These same counselors are normally available on a continuing basis throughout the student's entire freshman year.

Program Structure

Students in the Alternative Freshman-Year Program begin with 12 to 16 quarter hours of credit in their first academic quarter. In their second and third quarters, students in most tracks accelerate their schedules to take 16 quarter hours of credit per quarter. Students in the health science track take 17 quarter hours in their second quarter and 13 quarter hours in their third quarter.

After completing the prescribed Alternative Freshman-Year Program and achieving both a cumulative quality-point average of 1.400 or better and specific program requirements as noted, students may generally continue their degree programs within University College or transfer, with sophomore status, to any program in the

College of Business Administration or the College of Criminal Justice as well as certain non-science programs in the Boston-Bouvé College of Human Development Professions and the College of Arts and Sciences. In addition to the cumulative quality-point average of 1.400 or better, the College of Business Administration requires a 1.800 average in four key courses, namely, MTH 1113, ENG 4014, ECN 4601, and MGT 4110. Additional program requirements for students who would like to be admitted to sophomore status in the College of Pharmacy and Allied Health Professions are listed in the *Student Handbook for Basic Colleges*.

Faculty and Resources

The University has carefully selected for the Alternative Freshman-Year Program faculty members who are aware of individual student goals as well as the needs of students working to adjust to a college program. Faculty and students meet in small classes of not more than 25 students.

As members of the program, students are considered regular Northeastern University day students even though they have unique schedules and a distinctively tailored curriculum. Therefore, they generally have access to all counseling services, physical education facilities, dormitory arrangements, and extracurricular programs at the University's main campus in Boston.

Alternative Freshman-Year students are encouraged to make extensive use of the up-to-date programmed learning resources available for self-instruction through Northeastern's Learning Resources Center on the Boston campus. For additional assistance, Alternative Freshmen are also frequently referred to the Academic Assistance Center and/or the Math/Writing Center on the Boston campus. A third and very important resource, the Counseling and Testing Center, is also available to students on both the Boston and Burlington campuses for personal and academic counseling as well as for vocational testing and counseling.

Tuition and Fees

Tuition and fees for the Alternative Freshman-Year Program are the same as for students in the Basic, or Day, Colleges. Payment of the standard tuition during the first three academic quarters of residence entitles students to 48 credit hours of instruction. Thus, those who take the 40 programmed credits are entitled to an 8-quarter-hour tuition adjustment at the regular freshman rate.

Application Procedures

For more information on the Alternative Freshman-Year Program, or to request an application, write or call the Dean of Admissions, Department of Admissions, Northeastern University, 360 Huntington Avenue, Boston, MA 02115, telephone 617-437-2200.

Sample One-Year Program: Business Track

			quarter hours
Quarter 1			
CI 4003	Integrated Language Skills A		4
ENG 4013	Fundamentals of English I		4
MTH 1000	Math I*		4
HST 4110	History of Civilization A†		(4)
Total Quarter Hours			12-16
Quarter 2			
CI 4004	Integrated Language Skills B		4
ENG 4014	Fundamentals of English 2		4
MTH 1010	Math 2*		4
HST 4110	History of Civilization A (or ECN 4601 Economics I)†		4
Total Quarter Hours			16
Quarter 3			
ECN 4601	Economics I (or Directed Elective)†		4
HST 4111	History of Civilization B		4
MGT 4110	Survey of Business and Management		4
MTH 1113	Mathematics for Business*		4
Total Quarter Hours			16

*Students will be placed in one of three math courses depending on placement test results. Those receiving advanced placement have the option of completing MTH 1114 during freshman year.

†Eligible students may take HST 4110 in the first quarter, followed by ECN 4601 in the second quarter. Most students will take HST 4110 in the second quarter and ECN 4601 in the third quarter.

**Sample One-Year Program:
Criminal Justice, Education, Arts and Sciences Track**

quarter hours

Quarter 1

CI 4003	Integrated Language Skills A	4
ENG 4013	Fundamentals of English I	4
MTH 1000	Math I*	4
HST 4110	History of Civilization A†	(4)

Total Quarter Hours**12-16****Quarter 2**

CI 4004	Integrated Language Skills B	4
ENG 4014	Fundamentals of English 2	4
HST 4110	History of Civilization A†	4
SOC 4010	Sociology I	4

Total Quarter Hours**16****Quarter 3**

HST 4111	History of Civilization B	4
POL 4106	Introduction to Politics	4
SOC 4011	Sociology 2 (or Directed Elective)	4
Directed Elective#		4

Total Quarter Hours**16**

*Students will be placed in one of two math levels, depending on placement test results.

† Eligible students may take HST 4110 in the first quarter, followed by an elective in the second quarter. Most students will take HST 4110 in the second quarter.

#The Directed Elective is to be chosen with consideration for the student's intended major.

Sample One-Year Program: Health Sciences Track

quarter hours

Quarter 1

MTH 1010	Math 2	4
ENG 4013	Fundamentals of English 1	4
CHM 1110	Pre-Chemistry	5
CI 4001	Integrated Language Skills Development 1	2

Total Quarter Hours		15
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Quarter 2

MTH 1106	Fundamentals of Mathematics	4
CHM 1111	General Chemistry 1	5
CI 4002	Integrated Language Skills Development 2	2
ENG 4014	Fundamentals of English 2	4

Total Quarter Hours		15
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Quarter 3

BIO 1140	Basic Animal Biology 1	4
CHM 1112	General Chemistry 2	5
Directed Elective		4
Directed Elective		4

Total Quarter Hours		17
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Quarter 4

BIO 1141	Basic Animal Biology 2	4
MTH 1107	Functions and Calculus	4
Directed Elective		4

Total Quarter Hours		12
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Course Descriptions

Course Descriptions

Not all the courses listed in this bulletin will be offered. A final list of courses to be offered is contained in the *University College Schedule Guide*, which gives the hours, days, and locations of classes. These schedules are issued prior to the fall, winter, spring, and summer quarters.

Abbreviations

q.h.: quarter hours (credit earned)

cl.: hours required in class per week

Prereq.: prerequisite

Key to Department Codes

ACC	Accounting
ART	Art and Architecture
ASL	American Sign Language
BIO	Biology
BL	Business Law
CHM	Chemistry
CI	Integrated Language Skills
COM	Computer Literacy
DRA	Drama
ECN	Economics
ENG	English
ESC	Earth Sciences
FI	Finance
HMG	Health Management
HRA	Health Record Administration
HRM	Human Resources Management
HSC	Health Science
HST	History
HTL	Hotel and Restaurant Management
IM	Industrial Management
INT	Interdisciplinary
JRN	Journalism
LEN	Law Enforcement
LIB	Library Science
LNA	Language—Arabic
LNF	Language—French
LNG	Language—German
LNH	Language—Hebrew
LNI	Language—Italian
LNJ	Language—Japanese
LNL	Language—Latin
LNN	Language—Swedish
LNS	Language—Spanish
MG	Management
MIS	Management Information Systems
MKT	Marketing
MLS	Medical Laboratory Science
MS	Management Science
MTH	Mathematics
MUS	Music
NUR	Nursing
PED	Cardiovascular Health and Exercise
PHL	Philosophy and Religion
POL	Political Science
PSY	Psychology
PUR	Purchasing
RAD	Radiologic Technology
RE	Real Estate
REC	Recreation
SOA	Anthropology
SOC	Sociology
SPC	Speech Communication
TCC	Technical Communications
TRN	Transportation

ACC 4101 Accounting Principles I (3 q.h.)

Study of accounting issues and objectives for proper preparation and interpretation of financial statements. Covers the nature, function, and environment of accounting, the basic accounting model, and the accounting cycle, while emphasizing accounting for service and merchandising businesses. Also covers cash and accounts receivable.

ACC 4102 Accounting Principles 2 (3 q.h.)

Continuation of ACC 4101. Emphasizes issues in financial reporting, valuation, and income measurement. Includes receivables, inventories, plant and equipment, bonds, stockholders' equity, and cash flow. *Prereq.* ACC 4101.

ACC 4103 Accounting Principles 3 (3 q.h.)

Preparation and interpretation of cost accounting information and its use in the managerial decision-making process. Includes ratio analysis, present value, analysis of cost-volume relationships, fixed and variable costs, break-even analysis, job order, process cost, and standard cost systems. *Prereq.* ACC 4102.

ACC 4105 Accounting Principles I and 2

(Intensive) (6 q.h.)
Same as ACC 4101 and ACC 4102.

ACC 4110 Management Control for Nonprofit Organizations (3 q.h.)

Characteristics of management control in nonprofit organizations. Studies input-output measures, pricing, budgeting, and accounting control. For nonaccounting majors. *Prereq.* ACC 4102.

ACC 4120 Essentials of Personal Income Taxation (3 q.h.)

Special course for nonaccounting majors, designed to teach important aspects of personal income taxation on both federal and state levels. Tax laws, tax planning, and the preparation of individual returns are emphasized.

ACC 4301 Intermediate Accounting I (3 q.h.)

Introduction to financial accounting concepts, techniques, and procedures. Areas of intensive treatment are the development and framework of accounting theory, basic financial statements, and cash and receivables. *Prereq.* ACC 4103.

ACC 4302 Intermediate Accounting 2 (3 q.h.)

Continuation of the study of accounting concepts and procedures. Examines in detail inventories, tangible and intangible assets, and depreciation. *Prereq.* ACC 4301.

ACC 4303 Intermediate Accounting 3 (3 q.h.)

Comprehensive examination of stockholders' equity and earnings per share. Other topics include accounting changes and statements of changes in financial position. *Prereq.* ACC 4302.

ACC 4304 Intermediate Accounting 4 (3 q.h.)

In-depth analysis of such topics as deferred income taxes, pensions, leases, and price-level accounting. *Prereq.* ACC 4303.

ACC 4306 Intermediate Accounting I and 2 (Intensive) (6 q.h.)

Same as ACC 4301 and ACC 4302. *Prereq.* ACC 4103.

ACC 4310 Cost Accounting I (3 q.h.)

Foundations of cost accounting, including terminology, purpose, and relationship to financial accounting, and familiarization with product costing systems and their usefulness. *Prereq.* ACC 4103.

ACC 4311 Cost Accounting 2 (3 q.h.)

Budgetary planning and control, with emphasis on the use of cost data for current operations, special decisions, and long-range planning. *Prereq.* ACC 4310.

ACC 4313 Cost Accounting I and 2 (Intensive) (6 q.h.)

Same as ACC 4310 and ACC 4311. *Prereq.* ACC 4103.

ACC 4320 Advanced Accounting I (3 q.h.)

Problems associated with business combinations. Studies the purchase and pooling methods of consolidations. *Prereq.* ACC 4304.

ACC 4321 Advanced Accounting 2 (3 q.h.)

Accounting problems associated with partnerships and multinational corporations. Examines accounting for nonprofit organizations. *Prereq.* ACC 4320.

ACC 4325 Auditing I (3 q.h.)

Auditing concepts and standards relevant to the attest function. Includes the legal and ethical responsibilities of the independent certified public accountant, internal controls, an overview of EDP auditing and sampling, and auditor reports. *Prereq.* ACC 4303.

ACC 4326 Auditing 2 (3 q.h.)

Continued examination of auditing concepts and standards relevant to the attest function. Includes compliance and substantive tests as they relate to specific transaction cycles and the use of EDP and statistical sampling techniques. *Prereq.* ACC 4325.

ACC 4327 Auditing I and 2 (Intensive) (6 q.h.)

Same as ACC 4325 and ACC 4326. *Prereq.* ACC 4303.

ACC 4330 Internal Auditing I (3 q.h.)

How the modern internal audit function reviews and appraises diverse operations. Includes standards for professional practice, codes of ethics, administration of the internal audit department, review of internal controls, development of audit programs, an overview of EDP auditing and sampling, and auditor reports. *Prereq.* ACC 4303.

ACC 4331 Internal Auditing 2 (3 q.h.)

Continued examination of the modern internal audit function. Includes specific audit techniques, such as statistical sampling and the computer as an audit tool; the development of audit programs, workpapers, and reviews; operational audits; and fraud issues. *Prereq.* ACC 4330.

ACC 4340 Federal Income Taxes I (3 q.h.)

Application of federal tax laws to the individual's income, gains, losses, and expenses. Includes study of the individual's special deductions. *Prereq.* ACC 4303.

ACC 4341 Federal Income Taxes 2 (3 q.h.)

Continuation of ACC 4340. Studies specialized tax problems related to the individual, including installment sales and income averaging. *Prereq.* ACC 4340.

ACC 4342 Federal Income Taxes 3 (3 q.h.)

Continuation of ACC 4341. Studies application of federal tax laws to the corporation. Partnerships, trusts, and estate and gift taxes are also examined. *Prereq.* ACC 4341.

ART 4100 History of Art (3 q.h.)

History of Western art from prehistoric times to the end of the Roman Empire. Includes the study of major monuments, artists, and stylistic developments that evolved during the Prehistoric, Primitive, Egyptian, Mesopotamian, Aegean, Greek, and Roman periods. Slide lectures and discussions.

ART 4101 History of Art to the Sixteenth Century (3 q.h.)

History of Western art from the end of the Roman Empire to the late sixteenth century. Includes the study of major monuments, artists, and stylistic developments that evolved during the Early Christian, Byzantine, Early Medieval, Romanesque, Gothic, Early and High Renaissance, and late sixteenth-century Mannerist periods. Slide lectures and discussions.

ART 4102 History of Art to the Twentieth Century (3 q.h.)

History of Western art from the late sixteenth century to the twentieth century. Includes the study of major monuments, artists, and stylistic developments that evolved during the Baroque and Rococo periods, and in nineteenth- and twentieth-century Europe and America. Slide lectures and discussions.

ART 4105 Art through the Ages (3 q.h.)

Concentrated historical survey of Western art from prehistoric cave paintings to the twentieth century. Includes the study of major monuments, artists, and stylistic developments found in the Pre-Classical, Classical, Medieval, Renaissance, and Baroque periods, and in nineteenth- and twentieth-century Europe and America. Slide lectures and discussions.

ART 4106 Introduction to Art (3 q.h.)

Introduction to the language, techniques, aesthetics, and visual styles of painting, sculpture, graphic art, and

architecture. Includes individual and comparative studies of major works of art in each field, discussion of terminology, and historical examination of the social, political, and cultural significance of each art form. Slide lectures and discussions.

ART 4107 Introduction to the Great Museums of Europe (3 q.h.)

Introduction to the great museums of Europe, their settings, and important examples from their collections through a slide-lecture format. Includes the Egyptian Museum, Cairo; the National Museum, Athens; the Uffizzi and Pitti Museums, Florence; the Prado, Madrid; the Louvre, Paris; and the National Gallery, London.

ART 4110 Modern Art (3 q.h.)

Major movements and developments in painting, sculpture, and architecture from the late nineteenth century to the present. Emphasizes changing aesthetic views and the artistic, philosophical, historical, sociological, and political influences shaping those views and the modern movement as a whole. Slide lectures and discussion.

ART 4118 Sculpture Basics (3 q.h.)

Creative, three-dimensional expression in papier-mâché, cardboard, castoff, junk, clay, wire, and other materials. Includes a comprehensive examination of the design, dynamics, and energy flow of sculptural works.

ART 4119 Sculpture Experiments (3 q.h.)

A new look at sculpture techniques, including casting, carving, and additive, subtractive, and mixed-media expression.

ART 4120 Sculpture Studio (3 q.h.)

Tools, techniques, and materials used in traditional and nontraditional three-dimensional expression. Creative work in the aesthetics, dynamics, and applications of sculpture for personal enjoyment. Includes class and student-choice projects.

ART 4121 Principles of Drawing and Composition (3 q.h.)

Introduction to the fundamental principles of drawing and composition through formal graphic studies of line, shape, value, form, light, space, pattern, and texture. Stresses the use of pencil, charcoal, conté crayon, and other dry media. Slide lectures and critiques as needed.

ART 4122 Introduction to Figure Drawing (3 q.h.)

Introductory studio course in drawing the human form. Includes basic studies in anatomy, proportion, negative/positive space, contour, gesture, mass, line, composition, and drawing technique. Slide lectures, critiques, and weekly sessions drawing from the model.

ART 4123 Drawing Workshop (3 q.h.)

Introduction to more advanced problems in the analysis of visual language and its creative organization. Emphasizes strengthening drawing techniques and developing a personal style.

ART 4127 Basic Painting (3 q.h.)

Introduction to the fundamentals of painting. Includes formal studio assignments in the study of color, light, pictorial space systems, form, texture, and composition to establish a foundation for more individual, creative expression. Critiques and slide lectures as needed.

ART 4128 Intermediate Painting (3 q.h.)

Fundamental principles of painting, followed by more advanced studies in shape, scale, texture, brushstroke, and edge as well as color, light, form, and composition. Examines problems in a variety of stylistic approaches and techniques from the past and the present. Critiques and slide lectures as needed.

ART 4129 Painting Workshop (3 q.h.)

Individual development through a structured, project-oriented approach. Encourages recognition of the conceptual aspects of painting as well as the development of a personal painting style and unique visual imagery. Critiques and slide lectures as needed.

ART 4130 Printmaking: Relief (3 q.h.)

Fundamental course in the production of prints using the relief process. Includes woodcut, linoleum, block-cut, and other relief print techniques. Also explores paper stocks, inks, and carving and printing.

ART 4131 Printmaking: Silkscreen (3 q.h.)

Fundamental course in the production of prints using the stencil process. Includes hand-cut film techniques, brushed paper and blockouts, multicolor printing and registration, selection of inks and papers, and stretching and preparing a screen.

ART 4132 Printmaking: Intaglio (3 q.h.)

Fundamental course in the production of prints using the intaglio process. Includes etching, aquatint, dry point, engraving, sugar-lift, and other intaglio techniques. Focuses on drawing and design skills and on understanding the printmaking craft.

ART 4133 Basic Color and Design (3 q.h.)

Introduction to the principles of design and the science and art of color. Individual projects involve the student in perceiving, simplifying, and organizing basic images as structured form and space and in understanding the nature and properties of color.

ART 4134 Color and Design Practice (3 q.h.)

Intermediate-level problems in the aesthetic organization of color and design elements. Includes expressive possibilities of color orchestration, color harmonies, light as color, and the spatial characteristics of color.

ART 4136 Basic Watercolor Painting (3 q.h.)

Practice and creative expression in the technical fundamentals of watercolor.

ART 4137 Watercolor Painting Practice

(3 q.h.)

Creative expression in various watercolor techniques. Prereq. ART 4136 or instructor's permission.

ART 4138 Techniques of Watercolor Painting

(3 q.h.)

Advanced expression in watercolor. Prereq. ART 4137 or instructor's permission.

ART 4140 Graphic Communication and Production (3 q.h.)

The design and production process, including an introduction to lithography, screening, color techniques, composition, process camera, paper stocks, bindery methods, and economic factors. Also discusses effective techniques for integrating graphic and written communication.

ART 4141 Graphic Design I (3 q.h.)

Introduction to professional problem solving in graphic design. Includes study and creative work in design principles and their application; color; visual expression; layout concepts, techniques, and tools; design and graphic symbols; creative use of typography; and the integration of graphic forms with content to communicate ideas.

ART 4142 Graphic Design 2 (3 q.h.)

Intermediate study and creative work in professional problem solving in graphic design, with emphasis on creating overall design concepts. Students explore effective problem-solving techniques by taking a variety of projects from concept to finished presentation.

ART 4143 Advertising Design (3 q.h.)

Introduction to the advertising environment and to the language and design problems commonly met in the field. Study and creative work includes advertising layout, design, tools, and techniques; use of color; color printing processes; typography; and preparation of client presentations. Marketing fundamentals are also introduced.

ART 4145 Computer Literacy for the Graphic Designer (3 q.h.)

Introduction to the history, nature, and function of computers, with a special look at electronic imaging systems. Includes the range of computer technology from personal computers to large-scale, turn-key systems; the variety of input and output devices; the advantages and limitations of computers as design tools; and the computer's future impact on graphic communication. Lectures are complemented by hands-on computer sessions. Guest lecturers and field trips. Limited enrollment.

ART 4150 Graphic Design Tools and Techniques (3 q.h.)

Introduction to the variety of tools and tool skills encountered in the graphic design field. Begins with all-purpose tools, such as the T-square and triangle, and proceeds through the use of curves, templates, mechanical drawing instruments, and layout and rendering tools. Emphasizes specific applications from concept development through the finished mechanical. Demonstrations by the instructor and outside specialists.

ART 4151 Typography (3 q.h.)

The evolution of typography and its current applications. Emphasizes understanding basic typographic terms and techniques, acquiring composition skills such as copyfitting and type specification, understanding typography as symbol and as written record, exploring design concepts through typography, and learning the creative potential of new typesetting systems. Includes field trips to view state-of-the-art phototypesetting systems.

ART 4160 Basic Photography (3 q.h.)

Use of the camera, the negative, and the black-and-white print for the beginning student. Includes weekly shooting assignments, demonstrations, and hands-on darkroom experience. (Laboratory fee)

ART 4162 Photography Workshop (3 q.h.)

Through close interaction with the instructor, students may refine their technical skills and learn to make meaningful decisions about their relation to the world through the use of photography. Alternative processes such as infrared, toners, and large format are demonstrated and used. Contemporary trends in photography are illustrated through frequent slide presentations. *Prereq.* ART 4160 or equiv. (Laboratory fee)

ART 4163 Introduction to Color Photography (3 q.h.)

Basic color theory and contemporary photographic processes and practices. Students work with color negative materials and print from color slides and negatives. Color printing facilities are provided for student use. Lectures and critiques when appropriate. *Prereq.* ART 4160 or equiv. (Laboratory fee)

ART 4171 The American Film: From Arcade to Dream Factory (3 q.h.)

Rise of the American film from the early days of kineoscope peepshows and primitive arcade projections through the 1930s and 1940s and the golden age of Hollywood. Films representing major aesthetic, technical, or industry developments through 1946 are screened and discussed. Lectures, discussions, and assigned readings.

ART 4172 The American Film: Hollywood After Television (3 q.h.)

Development of the American film from the late 1940s to the present. Examines the threat of television, the breakdown of the studio system, the rise of

the independents, and the lateral development of the major studios within entertainment conglomerates. Emphasizes recent activity in American films, including the work of Coppola, Lucas, Spielberg, Allen, Altman, and others. Key recent films are screened and discussed. Lectures, discussions, and assigned readings.

ART 4173 International Directions in Film (3 q.h.)

Comparative study of international film movements since 1950 and their influence on film as an art form. Emphasizes key recent films, major directors, and writers. Includes Italian Neo-Realism (1940s); Polish and Czech postwar films; the French New Wave; the personal cinema of Fellini, Bergman, and others; the American "whiz kids"; New German Cinema; and the Australian school. Lectures, discussions, and assigned readings.

ART 4175 History of Graphic Design (3 q.h.)

Graphic design from the mid-nineteenth century to the present, with references to earlier influences. Focuses on the evolution of the graphic design field, its nature and function, major periods and trends, and the influence of the fine arts. The course concludes with an examination of contemporary directions in design. Slide lectures and discussion.

ART 4176 International Directions in Graphic Design (3 q.h.)

Contemporary theories and practices in international graphic design. Focuses on design activities in such major industrial nations as Germany, Italy, France, England, Canada, Japan, and the United States. Case studies reflecting graphic design solutions to a variety of visual communication problems are examined. Slide lectures and discussion.

ART 4181 Introduction to Computer-Aided Graphic Design (3 q.h.)

Introduction to the terminology, concepts, and applications of computer-aided graphic design. Through lectures, demonstrations, and labs, students explore the range of computer graphics technology from personal computers to large-scale, dedicated, turn-key systems; input and output devices and their applications; the advantages and limitations of computers as design tools; and the future impact of computer graphics on graphic design and communication. Lectures are complemented by hands-on computer sessions. Guest lecturers and field trips. Limited enrollment.

ART 4182 Computer-Aided Graphic Design Workshop (3 q.h.)

An extensive, hands-on workshop that explores the creative potential of computer graphics from free-form design through corporate identity, advertising layout, illustration, package design, electronic publishing, and media design. Also examines special video and film applications. Limited enrollment. *Prereq.* ART 4181 or equiv.

ART 4183 Electronic Imaging Systems (3 q.h.)

State-of-the-art imaging systems, including developments in high resolution graphics; full-color, laser-printed reproduction; image enhancement; still and moving image storage and manipulation; large-scale, integrated systems in printing and publishing; and artificially created environments, characters, and actions in television and movies. Recent research in image generation, manipulation, and reproduction is also explored. Guest lecturers, field trips, and video interviews.

ART 4204 Italian Renaissance Art (3 q.h.)

Italian painting, sculpture, and architecture of the fifteenth and sixteenth centuries, with special attention to their historical, cultural, and social contexts. Considers how Renaissance ideals were reflected in the renewed interest in classical harmony and order, and in the growing self-awareness, individualism, and naturalism of the time. Covers such artists as Giotto, Donatello, Botticelli, Michelangelo, da Vinci, Raphael, and Titian.

ART 4207 Chinese Painting (3 q.h.)

Work from the Ch'in and Han dynasties; the period of the Three Kingdoms; the Tang Dynasty; the Five Dynasties; the Northern and Southern Sung; the Yuan, Ming, and Ch'ing Dynasties; and twentieth-century developments.

ART 4208 Japanese Art (3 q.h.)

Development of Japanese painting, sculpture, and architecture from its inception through the twentieth century. Includes work from the Jomon period, the Suiko style, the Tang style (Nara and Early Heian), the Shinto Shrines period, the Later Heian period, the Kamakura period, the Ashikaga period, and the Momoyama period as well as the work of more recent artists such as Hokusai and Hiroshige.

ART 4210 French Painting (3 q.h.)

Development of French painting from the French Revolution through the nineteenth century. Examines Neoclassicism, Romanticism, Realism, Impressionism, and Post-Impressionism, focusing on such figures as David, Delacroix, Courbet, Manet, Degas, Monet, Renoir, Cezanne, and Van Gogh. Also examines the French interest in the formal problems of painting and the painting process as distinct from its narrative content.

ART 4213 Modern Painting (3 q.h.)

Developments in painting from the late nineteenth century through the early 1930s, examining major schools, movements, and artists (such as Van Gogh, Cezanne, and Dali) from Post-Impressionism through Surrealism. Focuses on important shifts in painting concepts and the rise of innovative modes of expression instrumental in establishing the foundation of Modernism.

ART 4214 Contemporary Painting (3 q.h.)

Developments in painting from the early 1940s to the present, including major schools, movements, and artists. Focuses on the cultural impact of the exodus of artists from Europe to the United States prior to World War II, the meteoric rise of Abstract Expressionism, and the diversity of movements since World War II, such as Pop Art, Minimalism, Conceptual Art, and New Realism.

ART 4217 Latin American Art (3 q.h.)

Development of architecture, sculpture, painting, and the decorative arts in Latin America from the Pre-Columbian period to the present. Includes the classic Maya and Toltec Maya of Central America and Mexico; the Aztecs of Mexico; the Mochica, Masca, Tiahuanaco, Chimú, and Incas of South America; and the rise of national artistic directions in modern Latin America.

ART 4219 American Indian Art (3 q.h.)

American Indian architecture, painting, sculpture, and the minor arts and crafts from Pre-Columbian cultures to the present. Includes the arts of Meso-America, the American Southwest, the Plains, the Northwest Coast, and the Eastern United States. Slide lectures and assigned readings.

ART 4220 American Painting and Sculpture (3 q.h.)

American painting and sculpture from colonial times through the early 1930s. Includes the study of painting from itinerant colonial "limners" through Copley, Benjamin West, and the English tradition; the Hudson River School; Eakins, Hopper, Marin, Stella, and O'Keeffe; and the founding of American Modernist painting. Also examines sculpture from colonial gravestone reliefs through Rush, August, and the public monuments of French, Saint-Gaudens, and Calder.

ART 4221 Women in Art and Women Artists (3 q.h.)

Women in the arts from prehistoric times to the present. Focuses on women as symbols, religious figures, and erotic objects, and on idealized images of femininity. Examples include fertility images, Venus images, madonnas, portraits, and genre works. Also examines the historical role of women as artists.

ART 4223 American Architecture (3 q.h.)

American architecture from the Colonial period through the early 1930s. Includes the seventeenth-century Early American style, the eighteenth-century Georgian style, the Republican style, mid-nineteenth-century Revival styles, the Stick-and-Shingle styles, Richardsonianism, Sullivan and the rise of the skyscraper, and Frank Lloyd Wright.

ART 4228 Twentieth-Century Architecture (3 q.h.)

European and American architecture of the twentieth century. Examines Gropius's Bauhaus tenets concerning housing, urban planning, and utilitarian mass

production; Mies van der Rohe, Le Corbusier, and the International style; Frank Lloyd Wright; and the foundation of American architectural Modernism as exemplified by Neutra, Johnson, Saarinen, and Buckminster Fuller.

ART 4230 History of Photography (3 q.h.)

Developments in photography from the early daguerreotypes to the present. Includes major movements, styles, artists, and significant technological developments. Slide lectures and assigned readings.

ART 4231 Contemporary Photography (3 q.h.)

Evolution of styles and techniques in contemporary photography since World War II. Emphasis is on the variety of image-making techniques and photographic styles and concepts of the last 20 years. Slide lectures and assigned readings.

ART 4251 Advanced Graphic Design (3 q.h.)

Continuation of ART 4142, emphasizing development of effective, professional design skills and personal style.

ART 4311 New York Art Seminar (3 q.h.)

The painting collections in the Metropolitan Museum of Art, Frick Collection, Museum of Modern Art, and the Guggenheim Museum.

ART 4366 Promotional and Technical

Publications: Design and Production (3 q.h.)

Design, production, and economics of promotional and technical publications. Using a case-study approach with selected hands-on projects, students explore design and production approaches to a variety of marketing, advertising, and sales-support publications as well as technical service manuals, operating guides, and other documentation. *Not open to students who have taken ART 4364 or ART 4365.*

ART 4367 Illustration (3 q.h.)

Introduction to advertising, medical, and editorial illustration, including illustration for magazines and books. Covers the tools, techniques, and objectives of each. Includes additional work in special categories, such as package illustration, gift trade illustration (greeting cards, wrapping paper, etc.), and architectural and interior illustration. Field trips to illustrators' studios and design offices.

ART 4368 Graphic Design for Media (3 q.h.)

The expanding use of slide-tape, multi-image, and multi-media video and film in areas ranging from public relations and sales to documentary and entertainment presentations. Explores the collaborative role of writers, producers, and art directors in the design and production of media projects, particularly audio-visual projects. Attention is given to the graphic effects possible with state-of-the-art equipment and production techniques unique to video and film.

ART 4500 Senior Project (3 q.h.)

Seniors choose a final major project to demonstrate professional proficiency and originality in a specific

area of design. Finished projects are reviewed by a board of design faculty with the student present to discuss and defend the effectiveness and merit of the project.

ART 4501 Portfolio Development (3 q.h.)

Opportunity for students to select and polish their best design pieces and create a unified, professional portfolio. Concentration is on materials and options available for showing two- and three-dimensional works in one-to-one and group situations. Attention is also given to the design résumé and to interview and presentation skills.

ART 4800 Directed Study I (3 q.h.)

Opportunity for qualified students to take an upper-level required course when the needed course is not available at the time recommended in the degree scheduling sequence. Petitions and procedural instructions are available in the Liberal Arts Program office. Allow at least six weeks to complete the petition process. *Prereq.* 87 q.h.

ART 4801 Directed Study 2 (3 q.h.)

Opportunity to initiate a second individual study as described in ART 4800. *Prereq.* ART 4800.

ART 4810 Honors Program I (4 q.h.)

Independent work in a selected area under the direction of members of the department. *Prereq.* Program Director's approval.

ART 4811 Honors Program 2 (4 q.h.)

Second opportunity to do independent work as described in ART 4810. *Prereq.* ART 4810 and Program Director's approval.

ART 4812 Honors Program 3 (4 q.h.)

Additional opportunity to do independent work as described in ART 4810. *Prereq.* ART 4811 and Program Director's approval.

ASL 4101 American Sign Language I (4 q.h.)

Introduction to American Sign Language, the language used by members of the deaf community in the United States and parts of Canada. Focuses on conversation in signs, basic rules of grammar, and cultural aspects of the deaf community.

ASL 4102 American Sign Language 2 (4 q.h.)

Continuation of basic American Sign Language and culture study, with emphasis on building receptive and expressive sign vocabulary; use of signing space; use of nonmanual components, including facial expressions and body postures; and an introduction to finger spelling. *Prereq.* ASL 4101 or by examination.

ASL 4201 Intermediate American Sign Language I (4 q.h.)

Further development of receptive and expressive skills, finger spelling, vocabulary building, and grammatical structures. Encourages more creative use of expression, classifiers, body postures, and the signing

space. Introduces sign variations (regional and ethnic), and political and educational institutions of the deaf community. *Prereq.* ASL 4102 or by examination.

ASL 4202 Intermediate American Sign Language 2 (4 q.h.)

Intensive practice involving expressive and receptive skills in storytelling and dialogue. Introduces language forms found in ASL poetry and cultural features as they are displayed in art and theatre. *Prereq.* ASL 4201.

ASL 4301 Advanced American Sign Language Proficiency 1 (4 q.h.)

Vocabulary building and mastery of grammar through rigorous receptive and expressive language activities. Includes student-led discussions, debates, and prepared reports on topics in deaf culture, society, and current affairs. *Prereq.* ASL 4202.

ASL 4302 Advanced American Sign Language Proficiency 2 (4 q.h.)

Continuation of ASL 4301. *Prereq.* ASL 4301.

ASL 4410 Linguistics of American Sign Language (3 q.h.)

For skilled ASL signers with no previous training in linguistics. Conducted in ASL, the course is descriptive and data-oriented rather than theoretical. Includes the parts of a sign; building words in ASL; sentence structure (questions, statements, relative clauses, etc.); the meaning and issue of iconicity; organization of sentences according to old and new information; and the structure of stories. Also, grammatical features of ASL, such as classifiers, specifiers, verb modulations and aspects, and the role of facial expression. *Not open to students who have taken ASL 4404.*

ASL 4411 Deaf History (3 q.h.)

The history of deaf people in the Western world, with emphasis on the American deaf community, its language, education, and relation to hearing society. *Not open to students who have taken ASL 4403. Prereq.* ASL 4101 or instructor's permission.

ASL 4412 American Deaf Culture (3 q.h.)

The status of deaf people as both a linguistic and cultural minority group. Designed for individuals who may or may not have had prior experience with deaf people, the course raises questions concerning the nature of sign language and its varieties, the education of deaf people, the historical treatment of deafness, the sociological and cultural makeup of deaf individuals, and the nature of ASL literature and poetry. *Not open to students who have taken ASL 4402.*

ASL 4413 American Sign Language Literature (3 q.h.)

Students read and discuss in ASL various genres of American Sign Language literature. Concentration is on the work of current recognized narrators in both literary and face-to-face storytelling traditions. Includes selected autobiographical sketches, lectures, stories, and letters from the early 1900s by such figures as

Clerc, Veditz, Hotchkiss, Gallaudet, and others. A videotaped research essay is required at the end of the course. *Not open to students who have taken ASL 4401. Prereq.* ASL 4202 or by examination.

ASL 4600 Introduction to Interpreting (formerly ASL 4501 Sign Language Interpreting 1) (3 q.h.)

The interpreting profession, including responsibilities, ethics, and aptitudes of interpreters; professional associations; the law and business of interpreting; the bicultural, bilingual context in which interpreting takes place; basic translation and interpretation; settings; special populations; free-lance versus in-house positions; and evaluation and certification. *Prereq.* ASL 4202 or instructor's permission.

ASL 4601 American Sign Language Interpreting 1 (4 q.h.)

Translations dealing with a variety of styles and registers; techniques for translating different styles, with emphasis on idiomatic expression; and consecutive interpreting. *Prereq.* ASL 4404 or concurrently, ASL 4302 and ASL 4600.

ASL 4602 American Sign Language Interpreting 2 (4 q.h.)

Breakdown of the task of simultaneous interpretation into several phases. Emphasizes divided attention, memory exercises, paraphrasing, and flexibility in English and sign language. *Prereq.* ASL 4601.

ASL 4603 American Sign Language Interpreting 3 (4 q.h.)

Refinement of skills learned in ASL 4602, with emphasis on transliteration. *Prereq.* ASL 4602.

ASL 4604 Special Topics in Interpreting 1 (3 q.h.)

Interpretation for special deaf populations, including the oral, deaf-blind, emotionally, and multiply handicapped. Theory and practice. *Prereq.* ASL 4601.

ASL 4605 Special Topics in Interpreting 2 (3 q.h.)

Interpretation in specific situations, including educational, legal, psychiatric, and medical. Emphasizes work with the intermediary interpreter. *Prereq.* ASL 4601.

ASL 4606 Interpreter Roles and Ethics (3 q.h.)

Discussions, hypothetical situations, and role plays exploring ethical standards and dilemmas in sign language interpreting and in other professions. Also, culturally objective standards, ethics, and professional principles; power versus responsibility; and the RID Code of Ethics. *Prereq.* ASL 4601 and ASL 4402, which may be taken concurrently.

ASL 4607 Interpreting Lab (4 q.h.)

Practice in simultaneous interpreting, with constructive feedback. *Prereq.* ASL 4603.

ASL 4608 Practicum (4 q.h.)

Practical interpreting experience in agencies serving deaf people. Biweekly seminar focuses on linguistic and ethical questions and dilemmas. Requires six hours per week in an agency. *Prereq.* ASL 4603, ASL 4604, ASL 4605, ASL 4606, and ASL 4607.

ASL 4800 American Sign Language Interpreting Seminar (formerly ASL 4507-ASL 4510 American Sign Language Interpreting Seminars) (1 q.h.)

Short-term training opportunities for currently practicing sign language interpreters, scheduled for two Saturdays each fall, winter, and spring quarter. Because the topics or skill areas addressed change from quarter to quarter, students may take this course repeatedly for credit. Limited enrollment. For topic information, call American Sign Language Programs, 617-437-3064 (voice) or 617-437-3067 (TTY).

BIO 4103 Biology I (General) (3 cl., 3 lab., 4 q.h.)

Biology of the cell, including its ultrastructure, function, diversity, genetics, and reproduction. Also examines the molecular composition of cells, including enzymes, chemistry, bioenergetics, respiration, and photosynthesis. *To receive credit for this course, you must also register for BIO 4153, Lab for BIO 4103.* (Laboratory fee)

BIO 4104 Biology 2 (Animal) (3 cl., 3 lab., 4 q.h.)
Functional anatomy of animal organ systems, including locomotion, nutrition, internal transport, gas exchange, molecular regulation, defense systems, nervous and hormonal control, and sensory reception. Also covers ecology, population dynamics, and the origin of life. *To receive credit for this course, you must also register for BIO 4154, Lab for BIO 4104. Prereq.* BIO 4103 or equiv. (Laboratory fee)

BIO 4105 Biology 3 (Animal) (3 cl., 3 lab., 4 q.h.)
Systematic comparative study of the diversity of animal life forms, including structure, function, environment, and evolution. *To receive credit for this course, you must also register for BIO 4155, Lab for BIO 4105. Prereq.* BIO 4104 or equiv. (Laboratory fee)

BIO 4175 Human Anatomy and Physiology I (2 cl., 2 lab., 3 q.h.)

Introduction to human gross anatomy, including osteology, myology, and angiology of the thorax, abdomen, pelvis, head, and neck. The laboratory generally includes a study of human bones and cat dissection. *The required laboratory is BIO 4195, Lab for BIO 4175. Prereq.* BIO 4105 or equiv. (Laboratory fee)

BIO 4176 Human Anatomy and Physiology 2 (2 cl., 2 lab., 3 q.h.)

Anatomy and physiology of the nervous system, endocrine glands, senses, respiratory system, and membranes. The laboratory generally includes gross and microscopic anatomy of the nervous and endocrine systems, and physiology of the nerves, muscles, vision,

hearing, and respiratory system. The required laboratory is BIO 4196, Lab for BIO 4176. *Prereq.* BIO 4175 or equiv. (Laboratory fee)

BIO 4177 Human Anatomy and Physiology 3 (2 cl., 2 lab., 3 q.h.)

Anatomy and physiology of the cardiovascular, digestive, urinary, and reproductive systems; fetal development. The laboratory generally deals with the microscopic anatomy of these systems and the physiology of the blood, heart, and urinary tract. *The required laboratory is BIO 4197, Lab for BIO 4177. Prereq.* BIO 4176 or equiv. (Laboratory fee)

BIO 4185 Man and His Biosphere I

(3 cl., 3 q.h.)

Ecological analysis of the human situation and human interaction with other organisms; the necessary foundation of biological principles.

BIO 4186 Man and His Biosphere 2

(3 cl., 3 q.h.)

Continuation of BIO 4185. *Prereq.* BIO 4185 or equiv.

BIO 4190 Microbiology I (2 cl., 3 lab., 3 q.h.)

Morphology and biochemistry of bacteria. *The required laboratory is BIO 4200, Lab for BIO 4190. Prereq.* BIO 4105 or equiv. (Laboratory fee)

BIO 4191 Microbiology 2 (2 cl., 3 lab., 3 q.h.)

Survey of pathogenic microorganisms. *The required laboratory is BIO 4201, Lab for BIO 4191. Prereq.* BIO 4190 or equiv. (Laboratory fee)

BIO 4192 Microbiology 3 (2 cl., 3 lab., 3 q.h.)

Characteristics and the role of microorganisms in the environment. *The required laboratory is BIO 4202, Lab for BIO 4192. Prereq.* BIO 4191 or equiv. (Laboratory fee)

BIO 4224 Ecology I (3 cl., 3 q.h.)

Environmental factors, such as the soil system, water, the atmosphere, temperature, light, wind, and pressure; physico-chemical factors such as CO₂, N, and mineral nutrients; the habitat; and the distribution of plants and animals in the world according to temperature and precipitation. *Prereq.* BIO 4105 or equiv.

BIO 4225 Ecology 2 (3 cl., 3 q.h.)

The ecosystem; ecological niches; producers, consumers, and decomposers; the pond, desert, forest, and seashore ecosystems; energy cycle and efficiency of energy utilization; mass, weight, and energy pyramids. *Prereq.* BIO 4224 or equiv.

BIO 4226 Ecology 3 (3 cl., 3 q.h.)

Population ecology, biotic communities and population growth, relations between the species, symbiosis, competition, predation, and succession. *Prereq.* BIO 4225 or equiv.

BIO 4235 Genetics I (3 cl., 3 q.h.)

Nucleic acid structure, replication of genetic materials, mitosis, meiosis, and Mendelian inheritance. *Prereq.* BIO 4105.

BIO 4236 Genetics 2 (3 cl., 3 q.h.)

Mutation, regulation of gene expression, population genetics, engineering, and genetics of bacteria and viruses. *Prereq.* BIO 4235.

BIO 4237 Genetics Laboratory (4 lab., 2 q.h.)

Laboratory exercises involving principles of Mendelian inheritance, linkage, and crossing-over. Classical genetics utilizing *Drosophila*; biochemical studies utilizing *Neurospora* and *E. coli*. *Prereq.* BIO 4236 or equiv. (Laboratory fee)

BIO 4246 Cell Biology I (3 cl., 3 q.h.)

Chemical composition, structure of cells and organelles, transport processes, cell motion and excitability, and growth. *Prereq.* BIO 4105, BIO 4236, and CHM 4263 or equiv.

BIO 4247 Cell Biology 2 (3 cl., 3 q.h.)

Cellular energy supply, enzyme function, respiration and metabolism, photosynthesis and other synthetic pathways, and control of cellular processes. *Prereq.* BIO 4246 or equiv.

BIO 4248 Cell Biology Laboratory

(4 lab., 2 q.h.)

Laboratory techniques in cell biology, microscopy, structure and chemical composition of cells, enzyme measurements, photosynthesis, respiration, active transport, and growth. *Prereq.* BIO 4247 or equiv. (Laboratory fee)

BIO 4258 Advanced Human Physiology

(3 cl., 3 q.h.)

Study of human physiology emphasizing cellular processes and underlying organ functions and the interactions and control of organ systems. Selected physiological topics are considered as time allows. *Prereq.* BIO 4177 and CHM 4113 or equiv.

BIO 4259 Advanced Human Physiology 2

(3 cl., 3 q.h.)

Continuation of BIO 4258. *Prereq.* BIO 4258.

BIO 4320 Medical Microbiology

(2 cl., 4 lab., 4 q.h.)

Major characteristics of disease-producing organisms. *The required laboratory is BIO 4330, Lab for BIO 4320, which generally meets on a different night. Prereq.* BIO 4192 or professional laboratory experience in bacteriology. (Laboratory fee)

BIO 4350 Histology-Organology I

(1 cl., 2 lab., 2 q.h.)

Morphology of cells and tissues. *The required laboratory is BIO 4360, Lab for BIO 4350. Prereq.* BIO 4105 or equiv. (Laboratory fee)

BIO 4351 Histology-Organology 2

(1 cl., 2 lab., 2 q.h.)

Tissue components of the nervous, integumentary, cardiovascular, urinary, and respiratory systems. *The required laboratory is BIO 4361, Lab for BIO 4351. Prereq.* BIO 4350 or equiv. (Laboratory fee)

BIO 4352 Histology-Organology 3

(1 cl., 2 lab., 2 q.h.)

Tissue components of the digestive and reproductive systems and of the liver and gall bladder. *The required laboratory is BIO 4362, Lab for BIO 4352. Prereq.* BIO 4351 or equiv. (Laboratory fee)

BIO 4441 Parasitology (2.5 cl., 3.25 lab, 4 q.h.)

Parasitic organisms, particularly those affecting humans and domestic animals, and their life cycles, modes of transmission, and diagnosis and treatment. Includes microscopic examination of prepared and live material. *Prereq.* BIO 4103 or instructor's permission.

BIO 4461 Immunology (2 cl., 4 lab., 4 q.h.)

Biological, chemical, and physical attributes of antigens and antibodies, together with their serological interactions. *The required laboratory is BIO 4462, Lab for BIO 4461, which generally meets on a different night. Prereq.* BIO 4192, CHM 4263, or equiv. (Laboratory fee)

BIO 4801 Independent Study in Biology

(4 q.h.)

Students focus on an area of special interest and relevance to their professional goals. Each student is paired with a faculty preceptor, who monitors and evaluates the completed project. Arrangements must be made with the Program Director prior to registering for the course; call 617-437-2818 for details.

BL 4101 Law I (3 q.h.)

Introduction to the legal system. Study of the nature, formation, and essential elements of contracts, including performance and remedies for breach. Also, agency law, including the rights and duties of principal and agent, the scope of authority, and relationships to third persons.

BL 4102 Law 2 (3 q.h.)

Sales as governed by the Uniform Commercial Code, including the law of warranty, business organizations, partnerships, corporations, and other important business forms. *Prereq.* BL 4101.

BL 4103 Law 3 (3 q.h.)

Commercial paper, the function of negotiability, bank checks and promissory notes, real property, personal property, bailments, bankruptcy, and secured transactions. *Prereq.* BL 4102.

BL 4105 Law (Intensive) (6 q.h.)

Same as BL 4101 and BL 4102.

BL 4115 Law and Social Issues (3 q.h.)

Structure and dynamics of the American legal system through analysis of selected cases dealing with social issues.

BL 4120 Law for Personal Planning (3 q.h.)

Legal aspects of personal and family planning, including consumer rights, wills and estate planning, marital law, real estate purchase, tenants' rights, and other selected topics of interest.

CHM 4101 Modern Chemistry I

(2 cl., 2.4 lab., 3 q.h.)

Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radioactivity, and air and water pollution. Topics are usually discussed from the viewpoint of recent developments. *The required laboratory is CHM 4107, Lab for CHM 4101. (Laboratory fee)*

CHM 4102 Modern Chemistry 2

(2 cl., 2.4 lab., 3 q.h.)

Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, amides, and carbohydrates and their relation to modern biology. *The required laboratory is CHM 4108, Lab for CHM 4102. Prereq. CHM 4101 or equiv. (Laboratory fee)*

CHM 4103 Modern Chemistry 3

(2 cl., 2.4 lab., 3 q.h.)

Fats, proteins, enzymes, the chemistry of digestion, and the chemical reactions of body fluids. *The required laboratory is CHM 4109, Lab for CHM 4103. Prereq. CHM 4102 or equiv. (Laboratory fee)*

CHM 4105 Chemistry and the Environment

(3 cl., 3 q.h.)

Fundamental chemical principles, using examples from the geochemical and the internal environments of human beings as well as the home, the farm, and the workplace.

CHM 4110 Chemistry Workshop (3 cl., 0 q.h.)

Discussion and problem-solving session to reinforce and re-examine material covered in CHM 4111, CHM 4112, and CHM 4113. Classes are small and informal and content is programmed according to students' needs.

CHM 4111 General Chemistry I

(2 cl., 2.4 lab., 3 q.h.)

Fundamental chemistry concepts, such as symbols, formulas, equations, atomic weights, and calculations based on equations. Also, gases, liquids, solutions, and ionization. *The required laboratory is CHM 4117, Lab for CHM 4111. Prereq. MTH 4112 or equiv. (can be taken concurrently). (Laboratory fee)*

CHM 4112 General Chemistry 2

(2 cl., 2.4 lab., 3 q.h.)

Atomic structure, bonding, molecular structure, oxidation and reduction reactions, and equilibrium and kinetics. *The required laboratory is CHM 4118, Lab for CHM 4112. Prereq. CHM 4111 or equiv. (Laboratory fee)*

CHM 4113 General Chemistry 3

(2 cl., 2.4 lab., 3 q.h.)

Thermochemistry and electrochemistry, acids, bases, and solubility products, nuclear chemistry, introductory organic chemistry, and biochemistry. *The required laboratory is CHM 4119, Lab for CHM 4113. Prereq. CHM 4112 or equiv. (Laboratory fee)*

CHM 4221 Analytical Chemistry I

(2 cl., 2.4 lab., 3 q.h.)

Principles of gravimetric and titametric analysis (wet chemistry). Introduces statistics as applied to analytical chemistry and examines such topics as chemical equilibrium and acid-base equilibria in simple and complex systems. Gravimetric and titametric experiments are performed. *The required laboratory is CHM 4227, Lab for CHM 4221. Prereq. CHM 4113 or equiv. (Laboratory fee)*

CHM 4222 Analytical Chemistry 2

(2 cl., 2.4 lab., 3 q.h.)

Continuation of CHM 4221, covering complex formation titration, precipitation titrations, and oxidation-reduction titrations. Electrical methods of analysis, such as potentiometry, electrolysis, coulometry, and polarography, are discussed and titametric analyses and experiments involving electricity are performed. *The required laboratory is CHM 4228, Lab for CHM 4222. Prereq. CHM 4221 or equiv. (Laboratory fee)*

CHM 4223 Analytical Chemistry 3

(2 cl., 2.4 lab., 3 q.h.)

Spectrophotometry as a method of analysis, including ultraviolet, visible, infrared, and fluorescence methods; flame emission; and atomic absorption. Solvent extractions and chromatographic methods of separation, such as gas-liquid chromatography and liquid chromatography, are studied. *The required laboratory is CHM 4229, Lab for CHM 4223. Prereq. CHM 4222 or equiv. (Laboratory fee)*

CHM 4224 Analytical Chemistry (Lectures and lab., 4 q.h., summer quarter only)

Principles and theories of volumetric, gravimetric, and instrumental analysis. Application made in the laboratory with analyses of unknown samples. *The required laboratory is CHM 4226, Lab for CHM 4224. Prereq. CHM 4113 or equiv. (Laboratory fee)*

CHM 4261 Organic Chemistry I (2 cl., 4 lab. and discussion, 4 q.h.)

Nature of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Introduces free radical and ionic mechanisms of reactions. The laboratory generally deals with the preparation and properties of compounds discussed in the lecture. *The required laboratory is CHM 4267, Lab for CHM 4261. Prereq. CHM 4113 or equiv. (Laboratory fee)*

CHM 4262 Organic Chemistry 2 (2 cl., 4 lab. and discussion, 4 q.h.)

Structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses, and reactions of the various types of organic compounds, including alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics. The laboratory generally deals with the preparation and properties of compounds discussed. *The required laboratory is CHM 4268, Lab for CHM 4262. Prereq. CHM 4261 or equiv. (Laboratory fee)*

CHM 4263 Organic Chemistry 3 (2 cl., 4 lab. and discussion, 4 q.h.)

Continuation of CHM 4262, emphasizing the application of chemical conversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes, and ketones. The laboratory generally deals with the preparation and properties of compounds discussed. *The required laboratory is CHM 4269, Lab for CHM 4263. Prereq. CHM 4262 or equiv. (Laboratory fee)*

CHM 4321 Instrumental Analysis I

(3 cl., 3 q.h.)

Basic theory of electrochemistry and electrochemical methods of analysis, including electrode and cell potentials, potentiometric titrations, direct potentiometry (pH meters and specific ion electrodes), coulometry, voltammetry, polarography, electrogravimetry, and conductometric methods. *Prereq. CHM 4223 or equiv. (This course may serve as preparation for certain graduate courses.)*

CHM 4322 Instrumental Analysis 2

(3 cl., 3 q.h.)

Basic theory of absorption and emission spectroscopy, including ultraviolet and visible spectroscopy, molecular fluorescence and phosphorescence, atomic absorption spectroscopy (flame, arc, spark, and plasma), and infrared and X-ray spectroscopy. *Prereq. CHM 4321 or equiv. (This course may serve as preparation for certain graduate courses.)*

CHM 4323 Radiochemistry (3 cl., 3 q.h.)

Basics of radioisotopes, including basic physics; the atomic nucleus; properties and production of radioisotopes; properties of nuclear radiation; dose calculations; ionization chambers; proportional, Geiger-Müller, and crystal and liquid scintillation counters; and the statistics involved in counting radiation. *Prereq. CHM 4322 or equiv.*

CHM 4371 Biochemistry I (3 cl., 3 q.h.)

The first of a three-course sequence. Includes cellular organization, pH buffers, and the biochemistry of amino acids, proteins, enzymes, and vitamins. *Prereq. CHM 4263 or equiv.*

CHM 4372 Biochemistry 2 (3 cl., 3 q.h.)

Biochemistry of carbohydrates, lipids, and nucleic acids; bioenergetics; and the metabolism of carbohydrates. *Prereq. CHM 4371 or equiv.*

CHM 4373 Biochemistry 3 (3 cl., 3 q.h.)

Metabolism of lipids, amino acids, and nucleotides and the biosynthesis of proteins, DNA, and RNA. *Prereq. CHM 4372 or equiv.*

CHM 4381 Physical Chemistry I (3 cl., 3 q.h.)

Thermodynamics, thermochemistry, First and Second Laws, entropy, and free energy in spontaneous processes. *Prereq. CHM 4113 or equiv.*

CHM 4382 Physical Chemistry 2 (3 cl., 3 q.h.)

Chemical equilibria, acids and bases, electrochemistry, colligative properties, phase diagrams, thermodynamics of multicomponent systems, and kinetic molecular theory. *Prereq. CHM 4381 or equiv.*

CHM 4383 Physical Chemistry 3 (3 cl., 3 q.h.)

Kinetics, quantum chemistry, and photochemistry. *Prereq. CHM 4382 or equiv.*

CHM 4801 Independent Study in Chemistry (3 q.h.)

Chemical-biological technology students focus on areas of special interest and relevance to their professional goals. Each student is paired with a faculty preceptor, who monitors and evaluates the completed project. Arrangements must be made with the Program Director prior to developing the project or registering for the course; call 617-437-2818 for details.

CI 4003 Integrated Language Skills A (4 q.h.)

Designed to help improve reading comprehension, study, and language skills. Covers basic reading comprehension and interpretation; such study skills as previewing, finding main ideas and details, outlining, and summarizing; and the interaction of communications skills, such as reading, writing, listening, and speaking. *For Alternative Freshmen only.*

CI 4004 Integrated Language Skills B (4 q.h.)

Continuation of CI 4003, emphasizing such study skills as researching, writing, and organizing term papers. Explores critical thinking in relation to the learning process. How to choose an academic major and career direction are also addressed, with emphasis on self-assessment and personal decision making. *For Alternative Freshmen only.*

COM 4101 Foundations of Computer Literacy (4 q.h.)

Introduction to computers, including data-base management, word processing, systems analysis and design, software packages, artificial intelligence, and trends in specialized types of office automation. Students have the opportunity to learn to program in BASIC. Hands-on labs reinforce lectures.

DRA 4101 Introduction to Theatre (3 q.h.)

Designed to increase the student's awareness and enjoyment of theatre, with attention to conventional and current forms of drama and their sources in theatre history. How theatre is made and the people who make it—actors, directors, writers and designers—are discussed, as are the nature of the audience and the relationship between theatre and society. Field trips to view theatre works in the Boston area.

DRA 4120 Acting for the Non-Actor (3 q.h.)

How acting training can benefit people in other professions. Discusses stress and relaxation, presentation of self, status in relationships, performance anxiety, and other problems in the context of the theatre. Employs acting exercises to help the student analyze and find methods for dealing with such situations.

DRA 4130 Prizewinning Plays (3 q.h.)

What makes a play win a Pulitzer Prize or a Tony Award? Examination of selected plays that have received one or more of these prizes, and of their production, provides some answers.

DRA 4140 Workshop for the Actor I (3 q.h.)

Physical preparation for the actor, including basic stage movement and deportment, control of the stage voice, analysis and establishment of characterization through observation and awareness of the body, and improvisations and short scenes.

DRA 4141 Workshop for the Actor 2 (3 q.h.)

Psychological preparation for the actor, including analysis and establishment of characterization through memory, emotion, imagination, and recall; analysis of specific roles; the creation of a character analysis book; and improvisations and short scenes. *Prereq.* DRA 4140 or instructor's permission.

DRA 4160 Drama Movement and Therapy (3 q.h.)

Exploration of teaching and rehabilitative methods, using the techniques of creative dramatics and dance/movement therapy. Emphasizes the exceptional child and the physically and emotionally handicapped.

DRA 4170 Creative Dramatics for Teachers (3 q.h.)

Introduction to the methods and creative techniques of using dramatics for programs in schools, churches, and recreational facilities. Teachers can learn how to use improvisation for self-improvement with students of all ages.

DRA 4200 The Comic Theatre (3 q.h.)

The writing and staging of works by Aristophanes, Molière, Shaw, and Neil Simon as well as the nature, function, and technique of comic writing and performance.

DRA 4210 The Shakespeare Experience (3 q.h.)

Seminar designed to give students the opportunity to view and critique live productions and/or motion picture and television versions of plays by William Shakespeare.

DRA 4230 The Boston Theatre Scene (3 q.h.)

Opportunity to view and critique live performances presented in the Boston area's major and "off-Broadway" theatres. Cost of theatre tickets not included in tuition.

DRA 4240 The Creative Cinema (3 q.h.)

Seminar designed to give students an opportunity to view and critique films and the work of directors, performers, and other creative personnel. Cost of cinema tickets not included in tuition.

ECN 4001 Overcoming Statistics Stress

(noncredit)

Often the most difficult part of any statistics course is the anxiety involved in taking the course. This seminar is designed to show students how to put aside those anxieties by understanding the components of statistics and developing techniques to simplify seemingly difficult word problems. Mathematical skills needed include addition, subtraction, division, multiplication, knowledge of square roots, and basic algebra.

ECN 4115 Economic Principles and Problems I (3 q.h.)

Application of the basic principles of economics to current public problems. Focusing on macroeconomics, the course discusses national income concepts, unemployment, inflation, national income and employment theory, and government expenditures and taxation.

ECN 4116 Economic Principles and Problems 2 (3 q.h.)

Continuation of ECN 4115, focusing on the role of the banking system, the Federal Reserve system, and supply-side policies. Topics in microeconomics include the role of a market pricing system; supply and demand, the costs of production; profits; and the supply decision. *Prereq.* ECN 4115 or equiv.

ECN 4117 Economic Principles and Problems 3 (3 q.h.)

Continuation of ECN 4116, focusing on markets and the allocation of resources. Topics include competitive markets, monopoly, oligopoly, factor markets, and income distribution. Economic principles are applied to selected problem areas, including poverty, pollution, energy, international trade, and the balance of payments. *Prereq.* ECN 4116 or equiv.

ECN 4118 Economics (Intensive) (9 q.h.)

Same as ECN 4115, ECN 4116, and ECN 4117.

ECN 4130 Medical Economics (3 q.h.)

Health care trends in the United States; causes for increases in medical care costs; supply and training of health care personnel; the nation's need for physicians,

nurses, pharmacists, and other allied health personnel; the quality of medical care; economics of health insurance plans; and consumer demand for health care, medical facilities, and professional and semiprofessional personnel.

ECN 4137 History of Economic Thought

(3 q.h.)

Development of economic thought, including Mercantilism as the first economic doctrine; analysis of the older, classical school with its later refinements (Modern Marginalism) and its important critics (socialists, Marxists); and Keynesian and modern developments.

ECN 4140 Economics of Crime

(3 q.h.)

Theoretical and empirical analyses of the economic causes of criminal behavior. The social costs of crime, its prevention, and techniques for designing optimum law enforcement policies.

ECN 4150 Energy Economics

(3 q.h.)

Economic, political, and historical background of energy and other resource problems, including examination of the future impact of primary resource limitations on U.S. and world economics and feasibility studies of resource substitution.

ECN 4215 Macroeconomic Theory

(3 q.h.)

Conceptual and empirical problems of creating and using national accounts; price index problems; conceptual and empirical evaluation of several consumption and investment functions and their policy implications; and multiplier and accelerator models. Includes a brief history of recent cyclical fluctuations as well as an analysis of inflation and growth theories in light of recent economic history. *Prereq.* ECN 4117 or equiv.

ECN 4216 Microeconomic Theory

(3 q.h.)

Supply and demand analysis, elasticity concepts and applications, theory of consumer demand, theory of production, and derivation of cost curves. Also, pricing and output behavior in the several market structures, their welfare implications, and the pricing of resources. *Prereq.* ECN 4117 or equiv.

ECN 4250 Statistics I

(3 q.h.)

Introduction to the collection and organization of data, including the measurement, presentation, and uses of elementary set theory; measures of central tendency and variability; basic probability; and probability distributions.

ECN 4251 Statistics 2

(3 q.h.)

Sampling and basic estimation techniques, "t" distribution, testing of statistical hypotheses, and analysis of variances. *Prereq.* ECN 4250 or equiv.

ECN 4252 Statistics 3

(3 q.h.)

Methods of econometric estimation and forecasting, including linear regression analysis, correlation analysis, time series analysis, and index numbers. *Prereq.* ECN 4251 or equiv.

ECN 4253 Statistics Intensive A

(formerly

Statistics Intensive) (9 q.h.)

Same as ECN 4250, ECN 4251, and ECN 4252.

ECN 4254 Statistics Intensive B

(6 q.h.)

Same as ECN 4250 and ECN 4251.

ECN 4255 Hands-On Statistics

(4 q.h.)

Statistics techniques and applications, including frequency distributions, measures of central tendency, measures of dispersion, probability and probability distributions, and sampling and estimation techniques. Class time is divided equally into lecture and laboratory; the latter focuses on individual, supervised problem solving. *Not open to students who have taken ECN 4250.*

ECN 4310 Labor Economics

(3 q.h.)

Economic analysis of the labor market, including the labor force, the demand for labor, and the institutions and policies dealing with them. Examines employment, unemployment, wage determination, and the development and efficient use of labor resources as well as collective bargaining issues and their economic consequences. *Prereq.* ECN 4117 or equiv.

ECN 4311 Human Resource Planning

(3 q.h.)

Assessment of government and private efforts to fight poverty and improve the labor market position of impoverished groups. Considers the relationship between causes of poverty and discrimination and possible remedies. Also considers training programs, negative income tax, family allowances, and other income maintenance schemes.

ECN 4312 Economic Concerns of Older Adults

(3 q.h.)

Designed to provide a basic knowledge of economic principles as they apply to senior members of the community. Includes how the U.S. economic policies and market system determine the price, quality, and availability of medical care and other allied services.

ECN 4315 Income Inequality and Discrimination

(3 q.h.)

Analysis of the composition of impoverished groups and recent trends. Examines the labor market, demographic and institutional forces contributing to poverty, the role of education, the economics of race and sex discrimination, the public welfare system, and proposed reforms.

ECN 4321 Urban Economic Problems and Policies

(3 q.h.)

Economic analysis of selected urban problems such as housing, poverty, transportation, education, health, crime, and the urban environment. Includes discussion of public policies relating to such problems.

ECN 4322 Economics of Transportation

(3 q.h.)

Transportation and land-use patterns, ownership, regulations, financing, social costs and benefits of various modes of transportation, and economies of new technology.

ECN 4330 Economic Growth and Development (3 q.h.)

Prospects for economic growth and development in impoverished nations as indicated by economic analysis and historical experience. Includes the social, cultural, and institutional determinants of growth and an analysis of agriculture and development.

ECN 4331 American Economic History (3 q.h.)

Economic development of the United States, with emphasis on the post-Civil War period and the effect of certain European developments.

ECN 4333 European Economic Development (3 q.h.)

Historical survey of European economic development from overseas expansion to the dissolution of empires and the Common Market. Examines the environmental impact of industrialism and the implications of living in a technological society.

ECN 4334 Comparative Economic Systems (3 q.h.)

Competing types of theoretical economic systems; analysis of the organization and operation of currently existing types of communist, socialist, and capitalist economies; and comparison and evaluation of the economic behavior and performance of different economic systems.

ECN 4335 International Economics I (3 q.h.)

Economics of international trade, including tariffs, use of resources, and balance-of-payment mechanisms. *Prereq.* ECN 4117 or equiv.

ECN 4336 International Economics 2 (3 q.h.)

International commercial policy, financial organizations, and recent problems. *Prereq.* ECN 4335 or equiv.

ECN 4342 Money and Banking I (3 q.h.)

Introduction to money and credit, commercial banking structure, and money creation as well as the problems and policies of centralized banking in the United States. *Prereq.* ECN 4117 or equiv.

ECN 4343 Money and Banking 2 (3 q.h.)

Theory of money, prices, and monetary policy; interest theory; debt management; and international monetary problems and analysis. *Prereq.* ECN 4342 or equiv.

ECN 4344 Government Finance (3 q.h.)

Fiscal functions, institutions, and politics; growth of the public sector; expenditure planning in theory and practice; cost-benefit analysis; principles of taxation and tax incidence; major taxes at federal, state, and local levels; fiscal policy for high employment, price

stability, and growth; and current fiscal problems, such as tax reform, urban fiscal problems, fiscal federalism, and income maintenance programs. *Prereq.* ECN 4117 or equiv.

ECN 4345 Business Cycles I (3 q.h.)

Intermediate macroeconomic theory, including theory of cyclical fluctuations in the context of multiplier and accelerator models. *Prereq.* ECN 4117 or equiv.

ECN 4346 Business Cycles 2 (3 q.h.)

Business cycle analysis, measurement, and public policy. *Prereq.* ECN 4345 or equiv.

ECN 4347 Business Cycles 3 (3 q.h.)

Business cycle forecasting methods and services. *Prereq.* ECN 4346 or equiv.

ECN 4348 Business Cycles (Intensive) (9 q.h.)

Same as ECN 4345, ECN 4346, and ECN 4347. *Prereq.* ECN 4117 or equiv.

ECN 4350 Introduction to Econometrics (3 q.h.)

Methods of econometric estimation and forecasting, including various statistical techniques. Students are given the opportunity to construct their own models and use computer facilities for estimation and forecasting. *Prereq.* ECN 4117 and ECN 4252.

ECN 4351 Problems in Economic Research (3 q.h.)

Research methods used by practicing economists. Topics include typical problems from areas of applied economics, such as choices of modeling framework, development of static and dynamic adaptive policy models, problems of data collection, review of estimation techniques, and interpretation of results. *Prereq.* ECN 4117 and ECN 4252.

ECN 4353 Introduction to Mathematical Economics (3 q.h.)

Introduction to mathematical analysis, with an in-depth study of theory of distribution. *Prereq.* ECN 4117 or equiv.

ECN 4360 Managerial Economics (3 q.h.)

Theory of demand, price, and output as applied to business firms and capital budgeting. *Prereq.* ECN 4117 or equiv.

ECN 4362 Industrial Organization and Public Policy (3 q.h.)

Theoretical framework for analysis and evaluation of the static and dynamic performance of real markets. Examines empirical studies that test the usefulness of applying theory to real markets and the existence of antitrust laws as a public policy designed to promote better market performance. *Prereq.* ECN 4117 or equiv.

ECN 4363 Government and Business I (3 q.h.)

Role of government in national economic affairs: theory and practice.

ECN 4364 Government and Business 2 (3 q.h.)

Relation between government and business; antitrust laws. *Prereq.* ECN 4363 or equiv.

ECN 4365 Government and Business 3 (3 q.h.)

Application of antitrust laws to business, with emphasis on cases, principles, and current antitrust problems. *Prereq.* ECN 4364 or equiv.

ECN 4490 Directed Study 1 (3 q.h.)

Opportunity for qualified students to take an upper-level course in their major on an individual basis. Petitions and procedural instructions are available from the Liberal Arts Program office, 617-437-2416. *Prereq.* 87 q.h.

ECN 4491 Directed Study 2 (3 q.h.)

Opportunity to initiate a second individual study as described in ECN 4490. *Prereq.* ECN 4490.

ECN 4492 Economic Policy Seminar (3 q.h.)

Most advanced course for senior economic majors, with emphasis on independent study and contemporary issues. *Prereq.* ECN 4117 or equiv.

ECN 4495 Honors Program 1 (4 q.h.)

Independent work in a selected area under the direction of members of the department. *Prereq.* Program Director's approval.

ECN 4496 Honors Program 2 (4 q.h.)

Second opportunity to do independent work as described in ECN 4495. *Prereq.* ECN 4495 and Program Director's approval.

ECN 4497 Honors Program 3 (4 q.h.)

Additional opportunity to do independent work as described in ECN 4495. *Prereq.* ECN 4496 and Program Director's approval.

ECN 4601 Economics I (4 q.h.)

Development of macroeconomic analysis, review of national income concepts, national income determination fluctuation and growth, the role of the banking system and the Federal Reserve system, government expenditures and taxation, international trade, and balance of international payments. *For Alternative Freshmen only.*

ENG 4005 English for International Students 1 (noncredit)

Introduction to the grammar and rhetoric of English as a second language. Practice in listening, speaking, and writing, with selected readings and exercises for improving vocabulary and pronunciation.

ENG 4006 English for International Students 2 (noncredit)

Intermediate course in English as a second language. Practice in preparing written and oral reports, including business and social letters. *Prereq.* ENG 4005 or equiv.

ENG 4007 Advanced English for International Students (3 q.h.)

Advanced course in English as a second language. Practice in special forms of writing to improve clarity, syntax, and organization. *Prereq.* ENG 4006 or instructor's permission.

ENG 4011 Elements of Writing (3 q.h.)

Intensive review of the grammatical forms and structural patterns of current English. Practice in writing sentences, paragraphs, and short papers.

ENG 4013 Fundamentals of English 1 (4 q.h.)

Intensive introduction to the principles of effective expository writing, emphasizing description, paragraph construction, and organization. Includes a review of the conventions of English usage, punctuation, and syntax. Essay assignments. *For Alternative Freshmen only.*

ENG 4014 Fundamentals of English 2 (4 q.h.)

Intensive instruction in exposition, argument, and academic essay and research paper writing, in addition to continued study of the conventions of English usage, punctuation, and syntax. Essay assignments. *For Alternative Freshmen only.* *Prereq.* ENG 4013 or equiv.

ENG 4110 Critical Writing 1 (formerly English 1) (3 q.h.)

Detailed examination of the principles and methods of rhetoric, especially narration, description, and exposition. Includes frequent practice in writing paragraphs and themes in those modes. A writing proficiency test is given at the first class meeting.

ENG 4111 Critical Writing 2 (formerly English 2) (3 q.h.)

Continued examination of the principles and methods of rhetoric, especially persuasion and argument, the study of short fiction, and the development of research skills. Includes practice in writing persuasive and critical themes and in preparing research papers. *Prereq.* ENG 4110 or equiv.

ENG 4112 Approaches to Literature (formerly English 3) (3 q.h.)

Further refinement of writing and analytical skills through the study of drama and poetry. Practice in writing longer critical papers. *Prereq.* ENG 4111 or equiv.

ENG 4120 English Literature: Faith and Humanism (3 q.h.)

English literature from its beginnings to 1700, including works by Chaucer, Spenser, Shakespeare, Donne, and Milton.

ENG 4121 English Literature: Reason and Romanticism (formerly English Literature to 1832) (3 q.h.)

English literature from the Neoclassical period to the Romantic age, including works by Pope, Swift, Johnson, Blake, Wordsworth, and Keats.

ENG 4122 English Literature: Victorians and Moderns (3 q.h.)

English literature from the Victorian Age through the early twentieth century, including works by Browning, Arnold, Hardy, Yeats, and Eliot.

ENG 4123 Early American Literature: Faith, Reason, and Nature (3 q.h.)

American literature from its beginnings through the nineteenth-century Transcendentalists, including works by Bradstreet, Taylor, Edwards, Franklin, Emerson, and Thoreau.

ENG 4124 American Romantics and American Realists (3 q.h.)

The fiction and poetry of nineteenth-century America, including works by Hawthorne, Melville, Whitman, Dickinson, Twain, James, Crane, and Dreiser.

ENG 4125 American Literature: The Modern Temper (3 q.h.)

The prose and poetry of twentieth-century America, including works by Eliot, Stevens, Fitzgerald, Hemingway, Wright, and Plath.

ENG 4131 God, Gods, and Heroes: The Literature of the Ancient and Medieval Worlds (formerly Major Writers of the Western World 1) (3 q.h.)

Literary traditions of the ancient world and the Middle Ages in the work of such writers as Homer, Virgil, Sophocles, Aristophanes, Dante, and Chaucer as well as in the art of biblical narrative.

ENG 4132 Man, Reason, and Imagination: Literature from the Renaissance to the Romantic Age (formerly Major Writers of the Western World 2) (3 q.h.)

Literary traditions of the Renaissance, Neoclassicism, and Romanticism in the work of such writers as Shakespeare, Milton, Voltaire, Racine, Wordsworth, and Whitman.

ENG 4133 Order and Disorder: Literature of the Moderns (formerly Major Writers of the Western World 3) (3 q.h.)

Literary traditions of Realism and Modernism in the work of such writers as Dostoyevsky, Ibsen, Joyce, Kafka, Woolf, and O'Neill.

ENG 4210 Science Fiction (3 q.h.)

Myths and rhetorical strategies of science fiction, including such novels as *Frankenstein*, *Childhood's End*, and *Stranger in a Strange Land*.

ENG 4211 Fantasy Literature (3 q.h.)

Development of fantasy literature in the nineteenth and twentieth centuries, focusing on the works of such authors as Lewis Carroll, Lord Dunsany, Kenneth Grahame, J. R. R. Tolkien, and Richard Adams.

ENG 4212 Horror Fiction (3 q.h.)

Horror literature and its concerns with the supernatural, the irrational, the nature of evil, and the landscape of dreams, including such novels as *Dracula*, *Dr. Jekyll and Mr. Hyde*, and *The Turn of the Screw*.

ENG 4213 Detective Fiction (3 q.h.)

Elements of intrigue, logic, and thought converge in this study of the who-done-it. Students sample a wide range of detective fiction to explore the questions of innocence and guilt, action and responsibility, power and authority, and victim and victimizer, and to see connections between this popular form of literature and its classical antecedents.

ENG 4214 The Psychological Novel (3 q.h.)

Mental and emotional processes affecting the form and style of such works as *Crime and Punishment*, *The Metamorphosis*, and *The Stranger*.

ENG 4220 Children's Literature (3 q.h.)

The psychology of creation, the ways of the imagination, and the role of fantasy and play in such children's books as *Alice in Wonderland*, *The Wizard of Oz*, and *Charlotte's Web*.

ENG 4221 Images of Women in Literature (3 q.h.)

Images of women and their underlying archetypes in imaginative literature. Includes such writers as Homer, Austen, Ibsen, and Lawrence.

ENG 4222 American Women Writers (3 q.h.)

Representative nineteenth- and twentieth-century American women writers, including such poets as Dickinson and Plath and such novelists as Chopin and Cather.

ENG 4223 British Women Writers (3 q.h.)

Important historical and thematic connections in the work of British women writers of the last 200 years, including the novels of Austen, Eliot, Woolf, and Lessing.

ENG 4230 Modern Irish Literature (3 q.h.)

Irish literature in English from 1885 to the present, including such writers as Yeats, Joyce, O'Casey, and Behan.

ENG 4231 Irish Writers in America (3 q.h.)

Irish themes and attitudes in the fiction and drama of twentieth-century America, including such writers as O'Neill, Donleavy, Alfred, and McHale.

ENG 4232 Ethnic Literature in America (3 q.h.)

The range, variety, and themes of ethnic literature in America in the work of such writers as Philip Roth, Toni Morrison, Maxine Hong Kingston, and F. Scott Momaday.

ENG 4233 Outside the Mainstream: The Literature of America's Subcultures (3 q.h.)

Literature that reflects the specific interests, values,

and concerns of America's diverse subcultural populations, including such works as *Black Elk Speaks*, *City of Night*, *Woman Warrior*, and the stories of Isaac Bashevis Singer.

ENG 4234 Modern American Voices: The New Essayists (3 q.h.)

Major nonfiction of the 1960s and 1970s, stressing the fresh styles and often disturbing cultural perspectives of such works as Mailer's *The Armies of the Night*, Pirsig's *Zen and the Art of Motorcycle Maintenance*, Dillard's *Pilgrim at Tinker Creek*, and Brautigan's *Trout Fishing in America* as well as shorter works of the "new journalism" and personal essays by such writers as Joan Didion, Tom Wolfe, Susan Sontag, and Woody Allen.

ENG 4240 Fiction and the Movies (3 q.h.)

Introduction to the exciting relationship between literature and cinema. Successes (and some failures) of efforts to transform famous novels and stories into worthy movies are studied by comparing the original book to the film version. Elementary film theory and criticism is taught and applied to such books-films as *Tom Jones*, *The Europeans*, *Sister Carrie*, *The Great Gatsby*, *Women in Love*, *The Big Sleep*, *The Treasure of the Sierra Madre*, *The Night of the Hunter*, *Lolita*, *The Last Picture Show*, *Shane*, *One Flew Over the Cuckoo's Nest*, *East of Eden*, and *Looking for Mr. Goodbar*. The number and choice of books-films may vary each quarter, depending upon the instructor and the availability of films.

ENG 4250 Biography and Nonfiction (3 q.h.)

Study of biography in an attempt to understand how individual behavior and achievement relate to social, cultural, political, and artistic values.

ENG 4260 The Literature of Adolescence (3 q.h.)

Adolescence as depicted in works drawn from different cultures and times. Examines popular versus literary views of adolescence, focusing on such themes as the struggle for self-definition, the role of peers, and the effects of gender and class.

ENG 4261 The Literature of Old Age (3 q.h.)

Old age as depicted in works drawn from different cultures and times. Examines popular versus literary views of old age, focusing on such themes as old age as a period of psychological reassessment; the role of family, class, and gender; and the emotional implications of confronting death.

ENG 4349 Expository and Persuasive Writing I (3 q.h.)

Designed to help students develop confidence and proficiency in writing. Through first drafts to revisions, weekly writing assignments concentrate on mastering the skills of subject focus, clarity of expression, controlled development, and organization. Attention is

given to improving grammatical accuracy and sentence structure during the revision process. *Prereq.* ENG 4110 or equiv.

ENG 4350 Expository and Persuasive Writing 2 (3 q.h.)

Development of precise and persuasive writing patterns through experiments with various rhetorical strategies. Students are expected to write extensively on topics of current interest to gain fluency and to learn how to target their writing toward different audiences. Assignments also provide practice in persuasive writing and in using different writing models to gain control of the material. *Prereq.* ENG 4349 or equiv.

ENG 4352 Expository Communications (3 q.h.)

Workshop in expository prose, emphasizing the practical problems of the writer on the job in advertising, public relations, or publishing. Includes practice in designing and writing special projects. *Prereq.* ENG 4349 or equiv.

ENG 4356 Creative Writing (3 q.h.)

Examination of a variety of writing genres for both writing majors and nonmajors. Includes exercises in such areas as journal writing, poetry, prose, drama, the short story, and the novel. Class members have the opportunity to read and discuss each other's work. Students may choose a favorite genre for a final writing project.

ENG 4357 Creative Writing: Poetry (3 q.h.)

Practice in writing different forms of poetry for beginning poets. Includes discussion and criticism of student work and selected texts.

ENG 4358 Creative Writing: Fiction (3 q.h.)

Practice in writing various types of short stories for beginning writers of short fiction. Includes discussion and criticism of student work and selected texts.

ENG 4359 Creative Writing Workshop (3 q.h.)

Discussion and criticism of student manuscripts for practicing writers.

ENG 4363 Writing for the Marketplace (3 q.h.)

Workshop for writers venturing into the marketplace, designed to provide a working knowledge of the publishing industry and useful practice in preparing and editing manuscripts for publication. Includes the development of effective strategies for composing query letters, synopses, outlines, and sample manuscripts.

ENG 4380 Business Writing and Reports I (3 q.h.)

Introduction to the vocabulary and philosophy of business communications. Practice in planning, writing, and analyzing effective business letters and memoranda. A writing proficiency test is given at the first class meeting.

ENG 4381 Business Writing and Reports 2

(3 q.h.)

Methods and principles of research and documentation of semitechnical analyses and business reports. Practice in organizing and writing complex forms of business communications. *Prereq.* ENG 4380 or equiv.

ENG 4383 Business Writing and Reports**(Intensive)** (6 q.h.)

Same as ENG 4380 and ENG 4381. A writing proficiency test is given at the first class meeting.

ENG 4500 The English Language (3 q.h.)

Development of modern English from its pre-Anglo-Saxon beginnings. Effects of Roman, Scandinavian, and Norman invasions; dialect geography; evolutionary change; and word formation and borrowing.

ENG 4501 Linguistics (3 q.h.)

Theories of the nature and origin of language, review of historical and comparative linguistics, prescriptive and descriptive grammars, and structural and generative-transformational phonology, morphology, and syntax.

ENG 4502 Semantics (3 q.h.)

The relation between language and behavior, levels of abstraction in communication, habits of evaluation of linguistic phenomena, and the modification of such habits for human understanding and survival.

ENG 4600 Topics in Literature (3 q.h.)

Examination of a variety of subjects and themes, such as the relationship between literature and the arts; the censored novel; alienation; and the Holocaust. Because the topics change from quarter to quarter, students may take this course more than once, provided that they focus on a different topic each time.

ENG 4602 Major Figures in Poetry (3 q.h.)

In-depth examination of the work of one poet, from apprenticeship to maturity. Poet chosen from among such major figures in England and America as Chaucer, Milton, Dickinson, and Frost. Students may take this course more than once, provided that they focus on a different figure each time.

ENG 4603 Major Figures in Fiction (3 q.h.)

Examination of the work of one fiction writer, from apprenticeship to maturity. Writer is chosen from among such major figures in England and America as Austen, Cooper, Joyce, Hemingway, and Bellow. Students may take this course more than once, provided that they focus on a different figure each time.

ENG 4610 The American Short Story (3 q.h.)

Development of the American short story from its nineteenth-century origins to its present forms. Includes such writers as Poe, Hawthorne, James, Hemingway, Roth, and Updike.

ENG 4611 The American Novel (3 q.h.)

Development of the novel in America and its characteristic qualities. Includes such writers as Cooper, Melville, James, Wharton, Faulkner, and Ellison.

ENG 4612 Contemporary American Poetry

(3 q.h.)

Structure and themes of poetry in post-1945 America. Includes such writers as Ginsberg, Plath, Snodgrass, and Wilbur.

ENG 4640 The Twentieth Century (3 q.h.)

The prose and poetry of such twentieth-century writers as Yeats, Eliot, Joyce, Lawrence, Woolf, Thomas, and Lessing.

ENG 4641 Contemporary English Poetry

(3 q.h.)

Structure and themes of poetry in post-1945 England. Includes the work of Gunn, Hughes, and Larkin.

ENG 4642 The English Novel (3 q.h.)

Development of the British novel from its beginnings in the eighteenth century through its concern with manners and morals in the nineteenth century to the experimentation of the twentieth century. Includes such writers as Fielding, Richardson, Austen, Dickens, Eliot, and Woolf.

ENG 4649 European and English Short Story

(3 q.h.)

Development of the short story in Europe and England in both the nineteenth and twentieth centuries. Such writers as de Maupassant, Balzac, Mann, Camus, Kipling, Lawrence, Greene, and Böll are examined in terms of their themes, forms, and techniques.

ENG 4650 Modern Bestsellers (3 q.h.)

The fascinating world of modern bestsellers, a world of romance and adventure, of high living and sinister intrigue, by such popular writers as Rona Jaffe, Harold Robbins, Jacqueline Susann, and Irving Wallace.

ENG 4651 The Continental Novel (3 q.h.)

Development of the European novel through its various forms and themes, from Balzac and Tolstoy to Proust and Mann.

ENG 4655 Contemporary Fiction (3 q.h.)

The range and variety of such post-1945 fiction writers as Bellow, Updike, Lessing, Gordimer, Baldwin, and Roth.

ENG 4658 Shakespeare the Dramatist (3 q.h.)

Detailed examination of representative plays from Shakespeare's early, middle, and late periods in order to illustrate his development as a dramatist and define his principal themes in such plays as *A Midsummer Night's Dream*, *Romeo and Juliet*, and *King Lear*.

ENG 4659 Shakespeare: The Major Tragedies and Comedies (3 q.h.)

Study of examples of Shakespeare's mature dramatic art, such as *As You Like It*, *Much Ado About Nothing*, *Hamlet*, *Macbeth*, and *Antony and Cleopatra*.

ENG 4800 Directed Study 1 (3 q.h.)

Opportunity for qualified students to take an upper-level required course when the needed course is not available at the time recommended in the degree sequence. Petitions and procedural instructions are available in the Liberal Arts Program office. Allow at least six weeks to complete the petition process. *Prereq.* 87 q.h.

ENG 4801 Directed Study 2 (3 q.h.)

Opportunity to initiate a second individual study as described in ENG 4800. *Prereq.* ENG 4800.

ENG 4802 Honors Program 1 (4 q.h.)

Independent work in a selected area under the direction of members of the department. *Prereq.* Program Director's approval.

ENG 4803 Honors Program 2 (4 q.h.)

Second opportunity to do independent work as described in ENG 4802. *Prereq.* ENG 4802 and Program Director's approval.

ENG 4804 Honors Program 3 (4 q.h.)

Additional opportunity to do independent work as described in ENG 4802. *Prereq.* ENG 4803 and Program Director's approval.

ESC 4100 Earth Sciences I (3 q.h.)

Fundamental components of the solid Earth and their modes of organization; the structure of the solid Earth and its mode of forming its crustal exterior; and the role of the oceans in building and shaping the continental masses.

ESC 4101 Earth Sciences 2 (3 q.h.)

Gaseous components of the fluid Earth, their organization into masses and systems, and their interaction. Long-range consequences of the fluid Earth's effects upon the solid Earth in the reshaping of land forms and the production of new land masses. *Prereq.* ESC 4101.

ESC 4102 Earth Sciences 3 (3 q.h.)

Earth as an object in space, the history of the Earth as identified through its solid materials, the implications of the Earth's history for other members of the solar system, and the solar system as a model for the universe. *Prereq.* ESC 4101.

ESC 4109 Earth Sciences (Intensive) (9 q.h.)

Same as ESC 4100, ESC 4101, and ESC 4102.

ESC 4159 Observational Astronomy (3 q.h.)

Introduction to the planets, stars, and constellations visible to the naked eye through lectures, visits to the planetarium, and actual viewing sessions. Emphasizes stars and constellations easily seen from mid-northern latitudes.

ESC 4200 Principles of Geology I (3 q.h.)

Crustal components of the Earth, their modes of formation, the forces involved in their shaping, and the relation of these factors to the structure and processes of the Earth's interior. *Prereq.* ESC 4100.

ESC 4201 Principles of Geology 2 (3 q.h.)

Forces and processes involved in the alteration, transportation, and deposition of crustal materials, their effects on the Earth's land forms, and the interactions of the oceans with the land masses. Not open to students who have credit for an equivalent course. *Prereq.* ESC 4200.

ESC 4202 Principles of Geology 3 (3 q.h.)

Sedimentary and radiochemical deposits of the Earth and their relevant contributions to understanding the history of the Earth. *Prereq.* ESC 4201.

ESC 4215 Principles of Oceanology I (3 q.h.)

Origin of the global ocean, the physical and chemical properties of sea water, the development of ocean currents and their effects on land masses of the world, and the problems of ocean pollution. *Prereq.* ESC 4101.

ESC 4216 Principles of Oceanology 2 (3 q.h.)

Habitat zones and organisms of the sea and the economic importance of renewable marine resources for an expanding world population. *Prereq.* ESC 4215.

ESC 4217 Principles of Oceanology 3 (3 q.h.)

Physiography and structure of ocean basins; marine geological processes and features; sedimentation, erosion, shorelines, and the topography of the ocean floor; and methods and techniques of marine geological exploration. *Prereq.* ESC 4216.

ESC 4230 Principles of Meteorology I (3 q.h.)

Composition and structure of the atmosphere, the issue of solar energy input, and the physical consequences for the dynamics of the atmosphere. *Prereq.* ESC 4101.

ESC 4231 Principles of Meteorology 2 (3 q.h.)

Formation, behavior, and interactions of air masses and the formation of fronts and storms. *Prereq.* ESC 4230.

ESC 4232 Principles of Meteorology 3 (3 q.h.)

Practices and procedures of weather reporting and forecasting, the formulation of weather maps, and the historical weather record and its value for studies of world climatology. *Prereq.* ESC 4231.

ESC 4245 Principles of Astronomy I (3 q.h.)

The nature and scope of astronomy, the geocentric and heliocentric universes, celestial reference systems, time and the calendar, the Sun-Moon-Earth system, and astronomical instruments. *Prereq.* ESC 4102.

ESC 4248 Historical Astronomy (3 q.h.)

Study of the numerous efforts to comprehend the nature of the universe through naked eye observations and simple instrumental techniques. *Prereq.* ESC 4102.

ESC 4249 Archaeo-astronomy (3 q.h.)

Artifacts, sites, and alignment factors that have recently been recognized as evidence that primitive cultures had a very sophisticated understanding of the night sky and its apparent behavior. *Prereq.* ESC 4102.

ESC 4332 Marine Resources (3 q.h.)

Quantitative and qualitative considerations of energy from the marine environment and current technological developments in the use of tidal power, off-shore oil, natural gas, and thermal and nuclear energy from the sea. Food resources of the sea, including analysis of world marine food production and technology, conservation, and mariculture. Shore erosion and coastal zone recreational resources. *Prereq.* ESC 4217.

ESC 4390 Solar System Astronomy (3 q.h.)

Individual components of the solar system. Contemporary results from the space probes are used to reassess our understanding of the origin and development of the solar system. *Prereq.* ESC 4102.

ESC 4391 Celestial Astronomy (3 q.h.)

The sun as a model star; variations of characteristics in single stars, star systems, and stellar populations; the H-R diagram and stellar evolution; and the significance of radio astronomy for stellar structure and stellar evolution. *Prereq.* ESC 4102.

ESC 4392 Cosmology (3 q.h.)

Structure and organization of the Milky Way galaxy; the nature of interstellar and intergalactic space; quasars, pulsars, and black holes; and cosmology. *Prereq.* ESC 4391.

ESC 4420 Conservation and the Nation (3 q.h.)

Conservation problems and land-use practices in the United States. Includes an in-depth study of the irrelevance of national boundaries to conservation issues.

ESC 4421 Conservation and the Community (3 q.h.)

Conservation problems and land-use practices at the local level. Includes an in-depth study of urban development and its impact on the environment.

ESC 4422 Conservation Management (3 q.h.)

Current conservation practices at the local level. Includes the role of relevant agencies, sources of knowledge and assistance, the nature and scope of practices needed, and the feasibility of community action. *Prereq.* ESC 4421.

ESC 4650 History of Ancient Sciences and Technologies (3 q.h.)

Development of science and technology prior to 1500 and their relationship to the society of the time. Classes combine lectures, discussion, and seminars based upon independent research and extensive outside reading.

ESC 4651 History of Modern Sciences and Technologies (3 q.h.)

Continuation of ESC 4650, from 1500 to the present. *Prereq.* ESC 4650.

ESC 4652 History of World Sciences and Technologies (Intensive) (6 q.h.)

Same as ESC 4650 and ESC 4651.

ESC 4801 Independent Study in Earth Science (3 q.h.)

Students focus on areas of special interest and relevance to their professional goals. Each student is paired with a faculty preceptor, who monitors and evaluates the completed project. Arrangements must be made with the Program Director prior to registering for the course; call 617-437-2818 for details.

FI 4101 Personal Finance (3 q.h.)

A practical approach to problems involved in managing personal finances. Includes financial planning, budgeting, obtaining credit and loans, income taxes, savings and investments, life insurance, home buying, and estate planning. Subjects are treated in a non-technical manner. Recommended for nonfinance majors.

FI 4301 Principles of Finance (3 q.h.)

The scope and nature of finance, introducing basic financial concepts and principles. Includes financial analysis, financial planning, working capital management, the time value of money, and an introduction to financial markets and different types of securities. *Prereq.* ACC 4102 and ECN 4116.

FI 4302 Financial Management (3 q.h.)

Introduction to financial management from both a domestic and an international perspective, using the case-method approach. Includes valuation, leverage, financial analysis and planning, working capital management, capital budgeting, cost of capital, and long-term and short-term financing decisions. *Prereq.* FI 4301.

FI 4303 Financial Strategy (formerly Financial Management 2) (3 q.h.)

Financial management using the case-method approach. Includes advanced capital budgeting, capital structure, decision making, dividend policy, leasing, convertibles and warrants, mergers, failures and reorganization, and the timing of financial policy. *Prereq.* FI 4302.

FI 4304 Financial Management (Intensive) (6 q.h.)

Same as FI 4302 and FI 4303. *Prereq.* FI 4301.

FI 4310 Investment Principles (3 q.h.)

Investment concepts, practices, and procedures. Reviews various types of investments, including the role of security markets and security analysis. *Prereq.* FI 4301.

FI 4311 Investment Management (3 q.h.)

Relationship between the economy and stock prices. Covers corporate analysis, earnings, dividends, and cash flow and introduces portfolio analysis. Studies technical analysis versus fundamental factors. *Prereq.* FI 4310.

FI 4312 Investments (Intensive) (6 q.h.)

Same as FI 4310 and FI 4311. *Prereq.* FI 4301.

FI 4320 Credit Principles (3 q.h.)

Introduction to credit and its functions. Examines the role of the credit executive, credit investigation, documentary credit, trade credit, and organization of the credit department. *Prereq.* FI 4301.

FI 4321 Credit Management (3 q.h.)

Forms of credit and collection services, including analysis of financial statements, determination of credit-worthiness, creditors' rights, adjustment bureau operations, credit insurance, and guarantees. *Prereq.* FI 4320.

FI 4325 Budgeting and Planning (3 q.h.)

Managerial planning, budgetary control, and financial analysis. Studies the interrelation between functional areas in an organization using consolidated profit planning as an integrating device. Covers fundamental financial analysis, comprehensive profit planning, general expense planning, production planning, materials planning, and purchasing. *Prereq.* FI 4301.

FI 4326 Financial Control (3 q.h.)

Development and application of variable budgets, planning and control of capital expenditures, computer applications in profit planning, cash flow planning and control, cost-profit-volume analysis, performance reporting, and analysis of budget variations. *Prereq.* FI 4325.

FI 4330 Management of Financial Institutions (3 q.h.)

Operation of bank and nonbank financial institutions and their role in the economy. Discusses operating objectives, services, asset management, and sources of financing and profitability. *Prereq.* FI 4302.

FI 4335 Bank Management (3 q.h.)

Financial management of commercial banks and thrift institutions. Problems of liquidity and investment management, loan portfolio and capital management, and various pricing problems in the context of a changing economic and regulatory environment. Lectures, discussions, and case studies. *Prereq.* FI 4302.

FI 4350 International Finance (3 q.h.)

Introduction to international finance management in the multinational corporation. Analyzes basic problems and finance considerations involved with international investments, trade, and payments. Also, planning in the international environment related to exchange rates, financial strategy, sources of capital, working capital management, fund flows, and management control through accounting and financial reporting. *Prereq.* FI 4303.

FI 4360 Commodities and Futures Markets (3 q.h.)

Commodities and futures markets and their objectives and operations, including hedging and speculation. Examines the role of banks and produce institutions in these markets and the techniques used to protect prices and positions. *Prereq.* FI 4311 or instructor's permission.

FI 4383 Personal Financial Planning (3 q.h.)

Development of financial planning expertise useful to those considering careers as personal financial planners. Includes budgeting, insurance, taxes, estate planning, basic investment vehicles and strategies, and related legal aspects. *Prereq.* FI 4301.

HMG 4100 Hospital Organization and Management I (3 q.h.)

Hospital organizational structure and administration. Focuses on the complex nature of health administration, its interdependent relationships and organizational strategy.

HMG 4101 Hospital Organization and Management 2 (3 q.h.)

Continuation of HMG 4100, emphasizing organizational issues and management techniques. *Prereq.* HMG 4100.

HMG 4103 Hospital Organization and Management (Intensive) (6 q.h.)

Same as HMG 4100 and HMG 4101.

HMG 4200 Health Science Statistics (3 q.h.)

Designed to give health practitioners the opportunity to learn to apply basic statistical techniques in the gathering, display, and interpretation of health data. Discusses principles of research design and agencies involved in collecting statistical data. *Prereq.* MTH 4111.

HMG 4210 Medical Care and Current Social Problems I (3 q.h.)

Presentation of some of the complex dilemmas faced in medical ethics today through lectures, seminars, and case studies. Includes the escalating cost of health care versus the ability to pay; teenage pregnancy; abortion; genetic counseling and screening; behavior control; alcoholism; and the "right to health care."

HMG 4211 Medical Care and Current Social Problems 2 (3 q.h.)

Such problem areas as child abuse; suicide; euthanasia; the withholding of treatment; the concept and exercise of informed, voluntary consent; patients' rights; the living will; human experimentation; and the allocation of scarce medical resources. *Prereq.* HMG 4210.

HMG 4215 Hospital Law and Ethics (3 q.h.)

Basic hospital legal issues relating to corporate and individual liability. Includes an analysis of consent and competency in health care, emphasizing bioethical questions raised by the removal of life-support systems.

HMG 4300 Home Health Care (3 q.h.)

Programs and techniques for providing effective community home health care and the impact of these programs on the health care delivery system.

HMG 4301 Health Care Delivery Systems (3 q.h.)

The structure, function, and organization of health care services.

HMG 4310 Principles and Practices of Community Health I (3 q.h.)

Community health care activities. Emphasizes community health promotion and the coordination and integration of medical and self-care activities with the needs, goals, and resources of the community.

HMG 4311 Principles and Practices of Community Health 2 (3 q.h.)

Continuation of HMG 4310, emphasizing specific community health problem. *Prereq.* HMG 4310.

HMG 4400 Health Care Financial Management I (3 q.h.)

Introduction to health care financial management, including issues in fund accounting, control, and reimbursement. *Prereq.* FI 4101.

HMG 4401 Health Care Financial Management 2 (3 q.h.)

Continuation of HMG 4400. *Prereq.* HMG 4400.

HMG 4425 Applied Health Care Management I (3 q.h.)

Practical application of management principles in health care organizations. Examines problem areas in health care management settings, using actual experiences and case studies to help students deal more effectively with the increasingly complex health care field. *Prereq.* HMG 4101.

HMG 4426 Applied Health Care Management 2 (3 q.h.)

Continuation of HMG 4425. *Prereq.* HMG 4425.

HMG 4430 Communications for Health Care Personnel I (3 q.h.)

Two-part course examining the need for careful interviewing techniques, thorough record keeping, and accurate and articulate health care correspondence. Emphasizes effective interaction between patients and health care personnel, and between health care workers and staff members of health care agencies.

HMG 4431 Communications for Health Care Personnel 2 (3 q.h.)

Continuation of HMG 4430. *Prereq.* HMG 4430 or instructor's permission.

HMG 4550 Contemporary and Controversial Health Care Issues I (3 q.h.)

Current health care problems. Emphasizes the interrelationships between the economic, social, political, and environmental factors involved in the development and delivery of health care.

HMG 4551 Contemporary and Controversial Health Care Issues 2 (3 q.h.)

Continuation of HMG 4550. *Prereq.* HMG 4550.

HMG 4600 Long-Term Care Administration I (6 q.h.)

Organization of care for the long-term and chronically ill patient. Examines the goals, purposes, and design of long-term care facilities as well as budgeting, financing, capital funding, and administration. *Prereq.* HMG 4101.

HMG 4601 Long-Term Care Administration 2 (6 q.h.)

Internal and external systems pertinent to the long-term care facility. Examines such topics as the nursing unit, the role of the physician, therapies, licensing agencies, hospitals, and methods for improving services. *Prereq.* HMG 4600 or equiv. or permission of Director of Health Professions.

HMG 4602 Long-Term Care Administration 3 (6 q.h.)

Long-term care institutions and their impact on the health care industry. Considers the nature and problems of aging and the care of the elderly in the home, in the community, and in institutions. A general survey and summary of the Massachusetts Nursing Home Administrators Licensure Examination is included. *Prereq.* HMG 4601 or equiv. or permission of Director of Health Professions.

HMG 4610 Principles and Practices of Community Mental Health (3 q.h.)

Introduction to the principles of community mental health, emphasizing the development, implementation, operation, delivery, and use of community mental health services.

HRA 4302 Medical Terminology Survey (3 q.h.)

Introduction to the medical terminology of a variety of medical disciplines. *Not open to health record students.*

HRA 4305 Language of Medicine I (2 q.h.)

Analysis and definition of medical terms, including anatomical, diagnostic, operative, symptomatic, and pathological terms. *Prereq.* Courses in Anatomy and Physiology.

HRA 4306 Language of Medicine 2 (2 q.h.)

Continuation of HRA 4305. *Prereq.* HRA 4305.

HRA 4308 Hospital Management for Health Record Administrators (3 q.h.)

Introduction to health care facility management principles. Examines the interaction of the board of trustees, administration, staff, and interdisciplinary

departments within a facility as well as licensing and accrediting agencies that set the standards and policies for health care facilities.

HRA 4310 Health Record Science 1 (6 q.h.)

Introduction to health records, covering health record history, numbering, filing, and security and the health record administrator's relationship to the health care facility. Stresses quantitative and qualitative analysis of the record; includes laboratory experience. *Prereq.* 80 q.h., including BIO 4177 and HRA 4306.

HRA 4311 Health Record Science 2 (6 q.h.)

Methods of record retention, security, and preservation; laws related to patient care and health records; classification theory; basic disease coding; and word processing and transcription. *Prereq.* HRA 4310.

HRA 4312 Health Record Science 3 (6 q.h.)

Basic principles of compiling statistics for hospital and health facilities. Includes preparation of reports, vital statistics reporting, classification theory, principles of disease coding, and special indices. *Prereq.* HRA 4311.

HRA 4313 Health Record Science 4 (6 q.h.)

Health care legislation, quality assurance, utilization review, PSROs, and planning agencies and their impact on record management. Introduction to specialized record systems. *Prereq.* HRA 4312.

HRA 4314 Health Record Science 5 (6 q.h.)

Continued study of specialized record systems. Includes ambulatory care, home care, and long-term care, approached in terms of information management and quality assurance. Discusses problems presented by changing patterns in health care delivery and reviews current literature. *Prereq.* HRA 4313.

HRA 4320 Organization of the Health Record Department 1 (3 q.h.)

The health record department and its organization, lines of responsibility and authority, and personnel roles and functions. Stresses management principles and practices. *Prereq.* HRA 4308, HRA 4312, and HRA 4324, or *Clinical Coordinator's permission.*

HRA 4321 Organization of the Health Record Department 2 (3 q.h.)

Health record department office management problems and their solutions, including quality control, time standards, budgeting, office manuals, and work simplification systems. *Prereq.* HRA 4320.

HRA 4324 Applied Health Record Science 1 (3 q.h.)

Clinical practicum in health record science in the general hospital. *Prereq.* HRA 4312.

HRA 4325 Applied Health Record Science 2 (2 q.h.)

Clinical practicum in health record science in specialized health settings. *Prereq.* HRA 4324.

HRA 4326 Applied Health Record Science 3 (4 q.h.)

Clinical practicum in health record management in the health care facility. *Prereq.* HRA 4325.

HRA 4330 Health Record Computer Science (3 q.h.)

Electronic data processing in the health record and hospital environment. Assesses state-of-the-art information systems and their future in health record management. *Prereq.* MIS 4101 and HRA 4314.

HRA 4332 Topics in Health Records (3 q.h.)

Current issues in health record administration, focusing on inservice, personnel management, health care finance, and computer applications and trends.

HRM 4301 Organizational Behavior (3 q.h.)

Fundamentals of organizational life, emphasizing the structure and discipline of groups typically found in a business setting. Issues and data related to leadership styles, employee motivation, and organizational dynamics. Requires significant student participation.

HRM 4302 Introduction to Human Resources Management (3 q.h.)

Introduction to the rights and responsibilities of employer organizations, individual employees, and employee organizations and how they influence personnel and labor relations activities within an organization. *Prereq.* HRM 4301.

HRM 4303 Applied Human Resources Management (3 q.h.)

Goals and structures of various employer and employee organizations are examined and evaluated in terms of effective human resources management. Discusses how the collective bargaining process changes in anticipation of future labor-management relations. *Prereq.* HRM 4302.

HRM 4304 Organizational Behavior and Introduction to Human Resources Management (Intensive) (6 q.h.)

Same as HRM 4301 and HRM 4302.

HRM 4310 Personnel Management 1 (3 q.h.)

The role of the human resources manager, the role of the personnel department in personnel planning and selection, and employment development and evaluation programs. Case-study analyses require student participation.

HRM 4311 Personnel Management 2 (3 q.h.)

Continued examination of human resources management. Includes labor-management relations, compensation programs, safety, and affirmative action functions. Case-study analyses require student participation. *Prereq.* HRM 4310.

HRM 4313 Personnel Management (Intensive) (6 q.h.)

Same as HRM 4310 and HRM 4311.

HRM 4320 Techniques of Employee Selection (3 q.h.)

Recruitment, selection, and placement techniques, including interviewing and employment testing.

HRM 4321 Wage and Salary Administration (3 q.h.)

Wage and salary determination, including merit and incentive plans, wage and salary structure, compensation methods, and the impact of employer-employee relations on the economy.

HRM 4322 Employee Benefits (3 q.h.)

Private and public programs related to job and worker income security. Includes unemployment compensation, training and employment services, private guaranteed income, retirement pension plans, and disability and group insurance.

HRM 4323 Job Evaluation (3 q.h.)

Wage-payment systems, wage determination, job elements, rating scales, the writing of job descriptions and specifications, selection of plans, development of wage structures, and principles of merit rating.

HRM 4324 Creative Problem Solving (3 q.h.)

Opportunity to learn and practice new ways of thinking. Discusses ways to sense and analyze problems, develop ideas, and evaluate and implement solutions, and examines the attitudes and climates conducive to creative thinking. Also provides methods for developing imagination, the key part of the creative process.

HRM 4330 Employment Rights—Wage and Hour Law (3 q.h.)

Minimum wage, hours of work, overtime, and other pertinent rules and regulations, and child labor laws, such as the Fair Labor Standards Act, the Davis-Bacon Act, and the Walsh-Healy Act. *Prereq.* HRM 4303.

HRM 4331 Employment Rights—Health, Safety, Disability, and Workers Compensation Law (3 q.h.)

Laws dealing with health, safety, disability, and compensation for work-related injuries. Covers Occupational Safety and Health Act, ERISA, Social Security, Unemployment Compensation, Workers Compensation, Federal Employees Liability Act, and other related laws. *Prereq.* HRM 4303.

HRM 4332 Employment Rights—Fair Employment Law (3 q.h.)

The old Civil Rights Laws (Sections 1981, 1983, 1985 [3], 1988); Title VI, VII, and IX of the Civil Rights Act of 1964; Age Discrimination in Employment Act; Equal Pay Act; Sections 503 and 504 of the Rehabilitation Act of 1973; Equal Opportunity Act 11246; Affirmative Action and related areas; and current rulings and court decisions regarding discrimination on the basis of race, sex, religion, national origin, age, and disability. *Prereq.* HRM 4303.

HRM 4340 Public Sector Collective Bargaining in the United States (3 q.h.)

Recent activities of employee unions in national, state, and local governments; weighing of the public interest; impact on services; and study of the administration of personnel and labor relations in these localities. *Prereq.* HRM 4303.

HRM 4341 Private Sector Collective Bargaining in the United States (3 q.h.)

Critical issues and problems affecting unionized employees, their organizations, employers, and the public in the private, domestic sector of our economy. Research and preparation of position paper by the student; class discussion. *Prereq.* HRM 4303.

HRM 4345 International Labor Relations (3 q.h.)

Comparison and contrast of selected international labor relations systems with that of the United States, including recent developments such as worker participation and co-determination. Research and preparation of position paper by the student; class discussion. *Prereq.* HRM 4303.

HRM 4346 Workshop in Labor-Management Relations (3 q.h.)

Negotiation skills, the use of mediation and fact finding in collective bargaining agreements, the interpretation and application of such agreements, and the use of arbitration. Student participation in simulated negotiation and grievance procedures. *Prereq.* HRM 4303.

HSC 4210 Basic Nutrition (3 q.h.)

Introduction to nutrition for students in the health field. Focuses on current scientific knowledge of nutrition and how this knowledge can guide an individual toward making appropriate food choices. Students should have a high school background in chemistry and biology.

HSC 4220 Basic Pharmacology (3 q.h.)

Introduction to the major classes of drugs. Presents the mode of action, common side effects, dosage, pharmaceutical forms, rate and route of administration, and known interactions and toxicities of the most commonly used drugs. *Prereq.* BIO 4177, CHM 4113, or equiv., or instructor's permission.

HSC 4301 Foundations of Medical Science I (3 q.h.)

The pathophysiology of major diseases. Discusses diagnosis and treatment, emphasizing inflammation, immunology, infectious disease oncology, endocrine disorders, and trauma. *Prereq.* BIO 4177 or equiv.

HSC 4302 Foundations of Medical Science 2 (3 q.h.)

Continuation of HSC 4301, using an organ-system approach to disease. Emphasizes cardiovascular, gastrointestinal, pulmonary, and musculoskeletal diseases. *Prereq.* HSC 4301.

HSC 4310 Public Health I (3 q.h.)

Principles of public health and current mental and physical health problems. Includes communicable diseases, mental health, maternal and child health, alcoholism, and chronic diseases. Also examines federal, state, and community resources mobilized to aid in prevention, identification, treatment, and rehabilitation.

HSC 4311 Public Health 2 (3 q.h.)

Continuation of HSC 4310, including environmental health; official, voluntary, and international health organizations; preventive medicine; and public health education.

HSC 4315 Environmental Problems and Health (3 q.h.)

Environmental conditions on land and in the air and water, including the causes of pollution, its effects on human and other life, and a general discussion of current control methods. Emphasizes the significance of environmental problems for the individual.

HSC 4320 Health Science Education I (3 q.h.)

Educational program design for the practitioner, including program planning, teaching strategies, and the development and evaluation of educational objectives.

HSC 4321 Health Science Education 2 (3 q.h.)

Continuation of HSC 4320, emphasizing program implementation and evaluation and student motivation. *Prereq.* HSC 4320.

HSC 4600 Advanced Nutrition (3 q.h.)

Food chemistry, nutrition, and physiology as applied to diet. Includes recent developments in normal nutrition and a critical review of the literature and experimental data on which principles of human nutrition are based. *Prereq.* BIO 4103, HSC 4210.

HSC 4601 Advanced Pharmacology (3 q.h.)

Prereq. HSC 4220 or equiv.

HSC 4602 Methods and Materials in Public Health Education (3 q.h.)

Introduction to public health education. *Prereq.* HSC 4311 or instructor's permission.

HSC 4610 Geriatric Nutrition (3 q.h.)

Integration of basic nutrition principles with the most current information on the aging process. Reviews state, local, and federal nutrition programs in terms of services, eligibility, and effect upon the elderly. *Prereq.* Knowledge of basic nutrition or instructor's permission.

HSC 4613 Oral Microbiology (3 q.h.)

Microbiota inhabiting the ecologic niches of the oral cavity. Examines factors that contribute to the role of bacteria in oral pathology, particularly caries and periodontal disease, and the relationship of bacteria and therapy. *Prereq.* BIO 4190.

HSC 4614 Advanced Periodontology I (3 q.h.)

Diagnosis, treatment, and control of periodontal diseases, starting with a review of the structure and purposes of the periodontal tissues. Emphasizes the role

of the dental hygienist in recognizing and treating disease, motivating and instructing the patient, and carrying out periodontal maintenance therapy. Includes mucogingival problems, furcation involvements, acute gingival infections, root planing, and gingival curettage. Students prepare a paper on a topic of special interest. *Prereq.* Dental Hygiene Certificate.

HSC 4615 Advanced Periodontology 2 (3 q.h.)

Latest advances and theories in periodontology. Includes the role of bacteria in pathology, immunopathology, and therapeutic alternatives. Class participation is stressed. *Prereq.* Dental Hygiene Certificate or instructor's permission.

HSC 4801 Special Topics in the Health Professions I (3 q.h.)

Independent study enables health science, health management, and health record students to focus on areas of special relevance to their professional goals. Materials are developed with the aid of a faculty advisor to reflect the student's special background and needs. Arrangements should be made with the faculty advisor prior to registering for the course. *Not open to medical laboratory science students.*

HSC 4802 Special Topics in the Health Professions 2 (3 q.h.)

Continuation of HSC 4801. *Not open to medical laboratory science students.*

HSC 4803 Special Topics in the Health Professions 3 (3 q.h.)

Continuation of HSC 4802. *Not open to medical laboratory science students.*

HST 4101 The Civilization of the Ancient and Medieval Worlds (formerly History of Civilization 1) (3 q.h.)

Development of human institutions up to the end of the Middle Ages. Emphasizes the continuities and changes that occur within civilizations and the similarities, differences, and relationships that exist among contemporary civilizations around the world. Explores implications of each historical period for our lives today.

HST 4102 The Civilization of the Early Modern World (formerly History of Civilization 2) (3 q.h.)

The period from the end of the Middle Ages to the French Revolution in 1789. Emphasizes the intellectual, technological, and political expansion of Europe and the reactions of the rest of the world to it. Special attention is given to such topics as the rise of dynastic states, the rise and fall of mercantilism, the scientific revolution, exploration and gunpowder technology, and order and revolution.

HST 4103 The Civilization of the Modern World (formerly History of Civilization 3) (3 q.h.)

The world from 1789 to the present. Includes capitalism, industrialization, nationalism, imperialism, the clash

of ideologies in the nineteenth century, and a study of total war in the present century. Based on this historical study, explores prospects for the future.

HST 4110 History of Civilization A (4 q.h.)

Major ideas and institutions of civilizations from ancient times to 1648. *For Alternative Freshmen only. Not open to students who have taken HST 4101 or HST 4102.*

HST 4111 History of Civilization B (4 q.h.)

Continuation of HST 4110, covering the period since 1648. *For Alternative Freshmen only. Not open to students who have taken HST 4102 or HST 4103.*

HST 4201 American History 1763-1848

(formerly American History 1) (3 q.h.)

America from 1763 to 1848, with attention to the development of political, economic, and social institutions in the new republic.

HST 4202 American History 1848-1917

(formerly American History 2) (3 q.h.)

The United States from 1848 to 1917, with attention to the Civil War, economic development thereafter, and the Progressive Era.

HST 4203 American History since 1917

(formerly American History 3) (3 q.h.)

The United States since 1917, an age of urbanized industrialism and international involvement and crisis.

HST 4241 The Historian's Craft (3 q.h.)

Ways in which the historian studies the past, with emphasis on research and writing.

HST 4263 Oral History (3 q.h.)

Learning history from those who lived it. Students conduct tape-recorded interviews of first-hand experiences in a selected area of twentieth-century history. Students need access to an audiotape recorder.

HST 4265 Introduction to Public History

(3 q.h.)

The new discipline of public historical archiving, the construction of historical displays and exhibits, the preservation and restoration of historic sites and structures, the editing of historical documents and journals, the operation of historical societies, and the production of historical media programs.

HST 4301 Technological Transformation of Society (3 q.h.)

The relation between technological innovations and the world in which they take place. Discusses conditions necessary for discovery and innovation and the impact of technology on the political, economic, and social environment.

HST 4302 History of Flight and Space (3 q.h.)

Beginning with the ancient Greeks' and Leonardo da Vinci's dreams of flight, the course traces the history of nonpowered flight from the balloon experiments of the Montgolfier brothers to contemporary

hanggliders; of powered flight from the Wright brothers through supersonic transport; and of rocketry and space travel from their beginnings through the *Enterprise*.

HST 4303 History of the Automobile (3 q.h.)

History of the automobile in Europe and America. Includes invention, production, impact on social and economic life, and the problems of pollution and energy.

HST 4304 History of Energy (3 q.h.)

How human beings have mobilized the forces of nature to survive, to alter and improve their lifestyles, and to dominate their fellow human beings. Emphasizes the transformation from one energy source to the available alternatives and the reasons for the choices made. Includes the change from human power to animal and machine power, the energy crisis of the sixteenth century, the turning from wood to water and coal power, the rising use of electricity and fossil fuels, the birth of the Atomic Age, and the contemporary history of the oil crisis.

HST 4401 Ancient Middle East (3 q.h.)

Study of ancient cultures and peoples in the Middle East to the rise of Islam.

HST 4403 History of the Jews I (3 q.h.)

Cultural and intellectual survey of the Jews from the end of antiquity to early modern times.

HST 4404 History of the Jews 2 (3 q.h.)

Role and position of the Jews in modern history.

HST 4407 Ancient Greece (3 q.h.)

Origin and development of Greek civilization.

HST 4408 Ancient Rome (3 q.h.)

Ancient Roman civilization, emphasizing the rise of the Republic and the decline of the Empire.

HST 4410 The Middle Ages (3 q.h.)

History of Europe from the fall of Rome to 1350.

HST 4412 Islamic History (3 q.h.)

History of the Muslim Arab world from the seventh century to the end of the Abbasid Caliphate in 1258.

HST 4420 Renaissance and Reformation

(3 q.h.)

History of Europe from 1350 to 1648, with attention to intellectual, religious, political, and economic developments.

HST 4424 Europe 1870-1921 (3 q.h.)

Background of World War I, including nationalism, militarism, imperialism, and the alliance system as well as the making of war and peace.

HST 4425 Europe since 1921 (3 q.h.)

Europe after World War I; World War II; the Cold War; and the efforts to unify the continent.

HST 4434 Family History (3 q.h.)

History of the family in Europe and America from 1600 to the present. Includes the changing nature and role of the family, marriage and divorce, child rearing, and aging.

HST 4435 Women in European History

(3 q.h.)

Historical examination of the position and role of women in European life.

HST 4443 European Intellectual History since 1815 (3 q.h.)

Main currents of European thought from Romanticism to the present and their social and political contexts.

HST 4455 Ireland since 1800 (3 q.h.)

The Irish question in British politics from the Act of Union to the present.

HST 4460 Hitler's Germany (3 q.h.)

Origins and nature of Hitler's Third Reich, emphasizing the personal lives of Nazi leaders in an attempt to understand how seemingly ordinary people could enthusiastically promote wars of aggression and revel in genocidal policies.

HST 4466 History of Eastern Europe since 1500 (3 q.h.)

Stefan Bathory and papal interest in Orthodox Russia; Western interference in Russia's "Time of Troubles"; Swedish invasions and the Northern War; the decline of Poland through Stanislaw Poniatowski and Czarina Catherine the Great of Russia. Also, the partitions of Poland and Tadeusz Kosciuszko; Napoleon; revolutionary movements through 1848; Slavic romantic revolutionaries and the *fin de siècle*; World War I and the reconstruction of eastern Europe; Hitler; Stalin; World War II; and the Iron Curtain.

HST 4467 Russia to 1917 (3 q.h.)

Emergence of Russia as a recognized European power; history of the Russian people and government to the revolutions of 1917.

HST 4468 Russia since 1917 (3 q.h.)

The revolutions of 1917 and the subsequent history of the Russian people and government, with special emphasis on foreign relations.

HST 4469 Russian Expansionism (3 q.h.)

Russia's quest for territory after 1500, with attention to the conquest of neighboring territories, the Sino-Russian disputes, and current issues in Soviet geopolitics.

HST 4501 American Indians (3 q.h.)

Survey of native Americans from pre-Columbian times to the present.

HST 4502 Colonial America (3 q.h.)

Exploration and settlement of North America; the development of political, social, and economic institutions; and the international rivalry to 1763.

HST 4503 The American Revolution (3 q.h.)

British-American relations after 1763; war and peace.

HST 4511 Populism and Progressivism (3 q.h.)

Topical history of the United States from 1890 to 1920, concentrating on its reactions to industrialization and urbanization.

HST 4512 The Age of Roosevelt (3 q.h.)

Topical history of the United States in time of world war, prosperity, depression, and war again.

HST 4513 Contemporary America (3 q.h.)

The American people from the close of World War II to the present.

HST 4523 American Diplomatic History

(3 q.h.)

Selected topics in the history of American foreign relations and policy since 1789.

HST 4530 American Economic History (3 q.h.)

Selected topics in the development of the capitalist economy in the United States, with attention to the role of government since 1789.

HST 4540 American Social History (3 q.h.)

Selected topics in the life of the American people since 1789.

HST 4542 Women in American History

(3 q.h.)

Historical examination of the position and role of women in American life.

HST 4543 African-American History (3 q.h.)

History of African Americans from colonial times to the present.

HST 4547 History of Sport in America (3 q.h.)

History of the major sports and their impact on American life.

HST 4548 American Heroes (3 q.h.)

Comparative exploration of the nature and functions of heroism in American history, using such individuals as George Washington, Jesse James, Amelia Earhart, Martin Luther King, and Bruce Springsteen as specific case studies.

HST 4549 American Inquisitions (3 q.h.)

Inquisitions in modern America, concentrating on the suppression of radical movements by both government and private groups.

HST 4550 Boston to 1822 (3 q.h.)

The Town of Boston from its establishment in 1630 to 1822 and the development of political, economic, and social institutions.

HST 4551 Boston since 1822 (3 q.h.)

The City of Boston, its annexations, and the changes in the ethnic nature of the population.

HST 4602 Contemporary Latin America

(3 q.h.)

Social, economic, and political development of the Latin American republics in the twentieth century.

HST 4603 The United States, Central America, and the Caribbean (3 q.h.)

Latin American countries nearest the United States and most affected by U.S. policies, particularly Cuba, Mexico, Nicaragua, El Salvador, and Guatemala. Emphasizes the historical background of current issues.

HST 4611 Africa since 1885 (3 q.h.)

The European impact on Africa, the rise of African nationalism, and the emergence of independent African states and their relations with other nations.

HST 4622 Modern Middle East (3 q.h.)

The Middle East since 1914, with attention to Zionism, Pan Arabism, the effects of two world wars, and the postwar settlements.

HST 4632 China since 1850 (3 q.h.)

A century of China's history, emphasizing the Western impact on Chinese civilization, China's struggle to maintain independence, and the victory of communism in the mid-twentieth century.

HST 4636 Japan since 1850 (3 q.h.)

Analysis of Japanese domestic developments and foreign relations since the mid-nineteenth century.

HST 4640 Third World Women (3 q.h.)

Role of women in the less developed, Third World areas, with special emphasis on aspects of change, development, and continuity.

HST 4645 History of the Vietnam Wars (3 q.h.)

History of military conflict in Vietnam, with attention to the rise of the Viet Minh during World War II, the struggle against the French in the first Indochina War, the impact of the Cold War, and the involvement of the United States after 1950 in Laos and Cambodia (now Kampuchea) as well as in Vietnam. Emphasizes the role of communism and nationalism in Indochina and the motives for American intervention. Includes films revealing American reaction to the escalating conflict.

HST 4801 Directed Study I (3 q.h.)

Opportunity for qualified students to take an upper-level course in their major on an individual basis. Petitions and procedural instructions are available from the Liberal Arts Program office, 617-437-2416.

Prereq. 87 q.h.

HST 4802 Directed Study 2 (3 q.h.)

Opportunity to initiate a second individual study as described in HST 4801. *Prereq.* HST 4801.

HST 4811 Honors Program I (4 q.h.)

Prereq. Program Director's approval.

HST 4812 Honors Program 2 (4 q.h.)

Prereq. HST 4811 and Program Director's approval.

HST 4813 Honors Program 3 (4 q.h.)

Prereq. HST 4812 and Program Director's approval.

HST 4821 Field Work in History (6 q.h.)

Extracollegiate experience doing historical research or working in historical agencies. (Refer to page 83 for a general description of field work courses.) *Prereq.* HST 4101, 4102, 4103; HST 4201, 4202, 4203, 4241; and Program Director's approval.

HTL 4301 Introduction to Hotel and Restaurant Management (3 q.h.)

The hospitality industry in today's economy. Emphasis is on industry growth and development, management problems, and principles of hotel and restaurant management.

HTL 4303 Front Office Management (3 q.h.)

Role and functions of the front office as they relate to the operation of the entire hotel. Covers front office structure, registration, payment, reservations, and night audit.

HTL 4304 Hotel and Restaurant Law (3 q.h.)

Introduction to the fundamental laws, rules, and regulations applicable to the hospitality industry. Includes hospitality management policies that minimize the danger of legal liability; innkeeping; restaurant management; alcoholic beverage control; labor laws; and legislation affecting the hospitality industry.

HTL 4305 Food Preparation I (3 q.h.)

Introduction to the fundamentals of food preparation and service, with emphasis on food service industry terminology and equipment. Includes menu planning, requisitioning, pricing, and preparation and service. In addition to classroom instruction, students prepare food in a small-quantity laboratory. (Laboratory fee)

HTL 4306 Food Preparation 2 (3 q.h.)

Continuation of HTL 4305. *Prereq.* HTL 4305. (Laboratory fee)

HTL 4307 Food Service Engineering and Sanitation (3 q.h.)

Organization of the maintenance and engineering function. Includes the technical information necessary to establish effective preventive programs. Details the fundamentals of sanitation for food service employees and includes practical guidelines for safe food handling. Provides the future hospitality manager with an opportunity for certification in Applied Food Service Sanitation from the National Institute for the Food Service Industry.

HTL 4308 Food and Beverage Cost Control (3 q.h.)

Introduces management attitudes toward cost controls through analysis of all aspects of the food service operation. Includes classification of food service facilities, cost accounting, purchasing, inventory, production

control methods, and the essentials of food and beverage controls. Develops management-mindedness through examination of organizational structures of food service and specific topics, such as menu pricing, break-even analysis, and cost-volume-profit theory. Emphasizes forecasting and achieving a profitable bottom line.

HTL 4309 Managerial Accounting for the Hospitality Industry (3 q.h.)

Financial practices and systems used in the hospitality industry. Analyzes controls, budgeting, financial statements, and specialized industry accounting procedures. *Prereq.* ACC 4102.

HTL 4310 Hospitality Marketing Management (3 q.h.)

The market in which the hospitality industry operates. Students have the opportunity to develop and implement a marketing plan to meet operational goals. *Prereq.* MKT 4301.

HTL 4313 Introduction to Tourism (3 q.h.)

Introduction to the science, art, and business of attracting, transporting, and accommodating visitors and graciously catering to their needs and wants. Includes sociological and psychological aspects, marketing, and the economics of tourism.

HTL 4320 Food Preparation (Intensive) (6 q.h.)

Same as HTL 4305 and HTL 4306.

HTL 4322 Consumer Food Preparation (3 q.h.)

Concepts and skills learned in HTL 4305 and HTL 4306 are applied in a restaurant setting. Preparation of complete menus for a service dining room, including appetizers, soups, salads, entrees, vegetables, and desserts. Stresses costing, menu planning, quantity recipe production, menu terminology, and kitchen organization. Coordinates food production with students in the dining room service course (HTL 4324). Classical kitchen stations are worked on a rotating basis. *Prereq.* HTL 4306 or HTL 4320.

HTL 4324 Dining Room Beverage Operation and Preparation (3 q.h.)

Introduction to the operation of a dining room with beverage service. Includes organization, personnel, methods of table service, menu terminology, table arrangement, requirements for supplies and equipment, sales promotion techniques, and revenue control. Students serve meals prepared by students in the food production course (HTL 4322). Also covers wine service and alcoholic beverage preparation and control. *Prereq.* HTL 4301.

IM 4301 Operations Management (formerly Production Management 1) (3 q.h.)

Identification and analysis of the operating system. Integrates modeling and simulation techniques and

methods, both quantitative and qualitative, and applies them to operation issues. *Prereq.* MS 4325.

IM 4310 Manufacturing Processes (3 q.h.)

Production processes and material selection in the production and manufacture of hard goods. Includes selection of best methods by study of casting, machinery, forming, joining, extrusion, finishing, and assembly. Analyzes advanced manufacturing processes, such as mass production, numeric control, central versus line layout systems, automated systems, computer control equipment and systems, equipment and machinery selection, and replacement policies.

IM 4311 Methods Analysis, Motion and Time Study (3 q.h.)

Methods analysis and plant layout, including work design, operations analysis, human-machine relationship, and elements of motion and time study. Studies measurement techniques and application as well as production standards development for job shop operations. Applies curve, table, equation, nomograph, family, and multivariable techniques and uses work-sampling methods.

IM 4312 Issues in Operations Management (formerly Operations Management) (3 q.h.)

Quantitative and qualitative points of view and their application to problems that arise in planning and controlling production and service businesses.

IM 4313 Cases in Industrial Management (3 q.h.)

Case-study analyses of complex operating situations faced by business managers. Integrates basic disciplines in the quantitative and behavioral sciences with an understanding of the specific situation. Cases are designed to provide the necessary background in topics relevant to production problems.

IM 4314 Production Control and Inventory Management (3 q.h.)

Theory and practice of the economic control of inventories. Covers a broad spectrum of models for production control and inventory management, problem solving through analytical methods and numerical simulation, and practical ways to apply concepts and techniques.

IM 4315 Industrial Decision Making I (3 q.h.)

Application-oriented introduction to prescriptive decision analysis. Examines the systematic approach to problem solving and decision making, decision theory, the structure of human decisions, and the modeling of the decision process. *Prereq.* MTH 4112.

IM 4316 Industrial Decision Making 2 (3 q.h.)

Application of probability and utility theory, psychology, and economics to the decision process. Includes the perception of options, uncertainties and objectives, decision trees and other modes of representation, and criteria of choice, including preference and utility,

attitude to risk, and expected value. Also covers practical application of techniques to career planning, job and organization design, and managerial effectiveness. Surveys current practices, using real-world cases. *Prereq.* IM 4315.

IM 4317 Materials Management (3 q.h.)

Development and examination of materials management, including objectives, organization, and functions as they relate to cost improvement, investment control, and the ability to serve the market. Materials systems and selected case studies.

IM 4318 Economic Analysis in Industry (3 q.h.)

Principles and techniques needed for analysis of the acquisition and retirement of capital goods by industry and government. Covers the assumptions underlying the various measures of anticipated profitability of capital expenditures and their uses and limitations.

IM 4319 Value Management (3 q.h.)

Organized technique for challenging costs by analyzing a product or method in terms of value, function, and costs without sacrificing essential quality.

IM 4320 Managing for Results (3 q.h.)

Serves as a forum for the discussion of the wide-ranging theories of Peter Drucker. Emphasizes the concepts and methods available to the results-oriented manager. Establishes the relations between theory and practice, including implementation.

IM 4321 Management and Operational Control Systems (3 q.h.)

The nature of control in general and the specific characteristics of management and operational control. Studies control structures, processes, and bases for design and implementation.

IM 4340 Seminar in Operations Management (formerly Manufacturing Seminar I) (3 q.h.)

Problems and opportunities found at the operating level. Includes the development of selected topics of interest to the student. *Prereq.* IM 4310 and IM 4314.

INT 4100 Planning a Business Career (3 q.h.)

Helps students develop career decision-making skills. Includes exercises to help students research various business careers by identifying and evaluating interests, values, skills, and competencies; examines resources and strategies such as field survey techniques. Also includes résumé preparation and interviewing techniques.

INT 4101 The Elements of Management (3 q.h.)

Introduction to the technical, quantitative, and specialized areas of management. Familiarizes students with the language and operational complexities of the manager's job and offers an opportunity to raise their level of diagnostic, analytic, and integrating competence. Four modules of three weeks each include economics and finance; budgeting and accounting; marketing; and information systems.

INT 4102 Women in Business Organizations I: Structural and Behavioral Fundamentals (3 q.h.)

Effective management practices and the factors that impede women from acquiring them. Stresses the importance of effective communication and dealing with criticism. Tests the validity of common behavioral assumptions, including women's fears of success, inadequate motivation, lack of social access, and disinclination to take charge or withstand pressure.

INT 4103 Women in Business Organizations 2: Leadership and Communications (3 q.h.)

Dynamics of leadership as they relate to the successful woman manager, including managing conflict, securing control, instituting change, motivating and disciplining others, gaining respect, and distinguishing supervisory from management performance standards. Role playing and case studies assist in the development of leadership and problem-solving capabilities. *Prereq.* INT 4102 or equiv.

INT 4110 Self-Assessment and Career Development (3 q.h.)

Understanding the concept of life and career planning and its practical implications for future education and/or work. Students complete a self-assessment, including an evaluation of their competencies and skills, and receive training in career decision making, with practice in the use of field survey techniques. Overview of job campaigning includes introduction to résumé preparation and interviewing techniques.

INT 4200 The Creative Process (3 q.h.)

Thought processes that allow individuals to be creative or original. Through interactive exercises and special projects in composition and problem solving, students can learn how to tap their own creativity. Students are asked to create an original piece of art, music, literature, or research.

INT 4201 Cultural Heritage Seminar (3 q.h.)

The interconnected ways in which art, music, literature, religion, and specific historical events have shaped our culture, values, and self-perceptions. Students undertake projects dealing with one or more themes included in their Cultural Heritage studies. *Prereq.* 27 q.h. in Cultural Heritage studies (see Liberal Studies program, page 96) or instructor's permission.

INT 4202 Contemporary Studies Seminar (3 q.h.)

Analysis and discussion of selected problems of the contemporary world, using analytical tools appropriate to the disciplines contained within the Liberal Studies curriculum. *Prereq.* 27 q.h. in Contemporary Studies (see Liberal Studies program, page 97) or instructor's permission.

JRN 4112 Fundamentals of Newswriting (3 q.h.)

How to write leads, organize basic news stories, gather facts, and interview. Analyzes news values and the structure of news organizations.

JRN 4113 Newsgathering and Reporting (3 q.h.)

Writing of multisource stories, both news and feature; public affairs reporting; advanced interviewing techniques; and legal issues. *Prereq.* JRN 4112 or equiv.

JRN 4114 News Reporting Techniques (3 q.h.)

How to write in-depth stories requiring significant research and introduction to investigative reporting. Includes libel, privacy invasion, and other legal matters affecting news media. *Prereq.* JRN 4113 or instructor's permission.

JRN 4250 Interpreting the News (3 q.h.)

The impact, both good and bad, of newspapers, television, radio, and other news media on American life. Examines how news is gathered, processed, and disseminated by the various media. "How much do we need the press as a watchdog on government?" and "Who is watching the watchdog?" are among the questions addressed.

JRN 4300 Photojournalism (3 q.h.)

How to use the camera, the negative, and the print in news or feature stories. Includes weekly photo shooting assignments and darkroom work. (Laboratory fee)

JRN 4335 Public Relations Basics (3 q.h.)

Concepts, components, and methods of public relations, including planning and research, processes of influencing public opinion, and policies concerning corporate and institutional relations with the media and various publics.

JRN 4336 Public Relations Practices (3 q.h.)

Specific practices and techniques employed in public relations, especially in relation to the handling of information and organization of activities and events. Also discusses how to define PR "targets" and how to deal with such publics as employees, stockholders, and consumers.

JRN 4337 Public Relations Problems (3 q.h.)

Research and communication techniques used to solve public relations problems and practical experience with individual PR projects, programs, and campaigns.

JRN 4349 Advertising Basics (3 q.h.)

Advertising research, planning, creative, and media functions and their interrelationships. Application of advertising principles to consumer, retail, political, and other advertising campaigns.

LEN 4100 Criminal Investigation and Case Preparation I (3 q.h.)

General investigation techniques, collection and

preservation of evidence and information, and consideration of particular crimes, such as arson, sexual offenses, larceny, burglary, robbery, forgery, and homicide.

LEN 4101 Criminal Investigation and Case Preparation 2 (3 q.h.)

The conducting of raids, surveillance, and undercover operations; methods of preparing a case for court; specialized scientific methods; and exercises involving prosecution and cross-examination techniques. *Prereq.* LEN 4100.

LEN 4102 Comparative Police Systems (3 q.h.)

Existing police systems in other jurisdictions, including an examination of the organization, administration, and practices of police agencies in the United States, Europe, and the United Kingdom.

LEN 4103 Introduction to Industrial Security (3 q.h.)

Historical, philosophical, and legal bases of security, including a survey of administrative, personnel, and physical aspects of the security field.

LEN 4107 Police-Community Relations (3 q.h.)

Role and function of police with both individuals and groups, including minority groups; police responsibilities regarding civil rights, civil disorders, and public protection.

LEN 4108 The Patrol Function I (3 q.h.)

The planning process related to the administration of the patrol function. Considers theoretical and operational aspects of various patrol systems, including the random patrol, the response force, the split force, and team policing; probability theory; and the relation between patrol and crime levels.

LEN 4109 The Patrol Function 2 (3 q.h.)

Continuation of LEN 4108, emphasizing the goals and objectives of police management models. Discussion and analysis of manpower, work load, response time, patrol communications, preventive strategies, and inputs and outputs of patrol systems evaluated in quantitative form. *Prereq.* LEN 4108.

LEN 4110 Introduction to Criminalistics I (3 q.h.)

The elements of microscopy, spectroscopy, and chemistry as applied to trace evidence in criminal investigations. Includes the responsibilities of technicians, investigators, and others.

LEN 4111 Introduction to Criminalistics 2 (3 q.h.)

Examines toxicology, serology, and procedures related to other types of physical evidence through laboratory demonstrations and practical exercises. *Prereq.* LEN 4110.

LEN 4112 The American Correctional System (3 q.h.)

The correctional field, covering probation, institutions, parole, historical developments, program content, and current problems and needs.

LEN 4115 Correctional Administration I (3 q.h.)

Correctional processes, services, standards, personnel, management principles, allocation of resources, and training of staff. Includes study of regular and special programs, volunteers, and outside contracts.

LEN 4116 Correctional Administration 2 (3 q.h.)

Further study of management principles, sentence reduction, discharge planning, and work release administration. Also, types of institutions, compacts, regional concepts, planning, organization, control and direction of corrections, and budgeting. *Prereq.* LEN 4115.

LEN 4118 Police Work with Juveniles (3 q.h.)

Role of the police in delinquency prevention, emphasizing theory, administration, control, treatment, confinement, community resources, and relationships with the public and the juvenile court.

LEN 4120 Juvenile Corrections I (3 q.h.)

Police, detention, petitions, and hearings related to juveniles. Juvenile court procedures, philosophy, and terminology and adjudication.

LEN 4121 Juvenile Corrections 2 (3 q.h.)

Social workers, probation officers, judges, psychologists, and psychiatrists in relation to juveniles; institutions; aftercare; prevention. *Prereq.* LEN 4120.

LEN 4122 Industrial Fire Prevention (3 q.h.)

Principles and practices of fire safety, including organization and management responsibility, property conservation, safeguards for construction, fire control apparatus and functions, engineering, and scientific data on fires and related perils.

LEN 4123 Retail Security (3 q.h.)

Operation of security departments, including functions of mercantile establishments; dishonest employees; shoplifters; management and public relations; receiving, shipping, and warehousing; special laws and procedures.

LEN 4125 Security Seminar (3 q.h.)

Analysis of current problems in security, such as growth patterns, salary structures, training and education, and existing weaknesses through field trips, individual study assignments, and required oral and written reports.

LEN 4126 Correctional Practices Seminar (3 q.h.)

Analysis of current problems in corrections designed to meet the needs and interests of specific groups of students, such as practitioners, supervisors, and administrators of correctional programs.

LEN 4127 Current Security Problems (3 q.h.)

Analysis of special problem areas such, as security education and training, community relations, white-collar crime, drug abuse, theft control, shoplifting, document control, subversion and sabotage, protection of classified information, control of proprietary information and business espionage, labor problems, civil disturbances, and natural and preventable disasters.

LEN 4128 Victimology Seminar (3 q.h.)

Criminal-victim relationships, emphasizing victim-precipitated crimes and compensation to victims. Considers the concept and significance of "victimology"; time, location, sex, age, and occupational factors in criminal-victim relationships; victims of murder, rape, and other violent crimes; victims of property crimes; victim typology; the public as victim; restitution and compensation to victims of crime; and the functional responsibility of the victim.

LEN 4129 Criminal Behavior Seminar (3 q.h.)

Crime and criminal behavior as a social phenomenon divided into three principal areas: sociology of law and its effect, criminal etiology and the scientific analysis of the causes of crime, and evaluation of the various rationales of detention as a crime-control factor.

LEN 4132 Administration of Justice I (3 q.h.)

Historical survey of the evaluation of justice from the earliest times, with emphasis on Western and American justice. Includes the roles played by the judiciary, stressing due process and constitutional guarantees.

LEN 4133 Administration of Justice 2 (3 q.h.)

Various groups and professions within the American justice system. Emphasizes human relations, efficiency, current trends, and the future role of the American criminal justice system. *Prereq.* LEN 4132.

LEN 4134 Civil Law in Criminal Justice I (3 q.h.)

Civil matters, such as defamation, negligence, assault and battery, false confinement, trespass, conversion, and agency relationships.

LEN 4135 Civil Law in Criminal Justice 2 (3 q.h.)

Civil matters, such as the law of contracts, bailments, domestic relations, and business relationships that should be known to and understood by law enforcement personnel. *Prereq.* LEN 4134.

LEN 4136 Criminal Law I (3 q.h.)

Major problems of criminal law as a device for controlling undesirable behavior. Includes basic questions of public policy involved in the administration of criminal justice as well as the legal principles of determining criminal liability. Considers specific crimes, including the elements of a crime, the parties to a crime, and the defenses to a crime.

LEN 4137 Criminal Law 2 (3 q.h.)

Vital constitutional and statutory concepts, including self-incrimination, search and seizure, law of arrest,

criminal procedure and responsibility, confessions, right to counsel, and conduct of trial in the district, superior, appellate, and federal courts. *Prereq.* LEN 4136.

LEN 4138 Evidence and Court Procedure I
(3 q.h.)

Rules of evidence, principles of exclusion, and evaluation and examination of evidence and proof.

LEN 4139 Evidence and Court Procedure 2
(3 q.h.)

Competency, consideration of witnesses, laws of search and seizure, court procedures, and moot court exercises. *Prereq.* LEN 4138.

LEN 4140 Fire Investigation and Arson I
(3 q.h.)

Elementary chemistry of combustion, including sources of ignition, fuels, and the nature, behavior, and toxicity of gases. Combustion properties of nonsolid fuels as opposed to solid fuels, explosions associated with fires, and the socio-economic aspects of fire, including the role of the pyromaniac and his or her physiological involvement.

LEN 4141 Fire Investigation and Arson 2
(3 q.h.)

Carbon, hydrogen, and oxygen as major elements in all fires; the flameless ignition effect; methods of fire-proofing; and the role of pyrolysis. Also considers fire patterns of structural fires, asphyxiation, and the legal aspects of arson. *Prereq.* LEN 4140.

LEN 4144 Security Administration I (3 q.h.)
Historical, philosophical, and legal bases of security operations. Includes a study of various security methods and the use of personnel, equipment, and procedures.

LEN 4145 Security Administration 2 (3 q.h.)
Organization, administration, and management of the security function, including the systems approach to security operations and the use of personnel and equipment. *Prereq.* LEN 4144.

LEN 4147 Legal Aspects of Security Operations (3 q.h.)

Areas of law relevant to the security professional, including related aspects of criminal, civil, regulatory, and labor law.

LEN 4153 Criminal Law (Intensive) (6 q.h.)
Same as LEN 4136 and LEN 4137.

LEN 4154 Evidence and Court Procedure (Intensive) (6 q.h.)
Same as LEN 4138 and LEN 4139.

LEN 4155 Civil Law in Criminal Justice (Intensive) (6 q.h.)
Same as LEN 4134 and LEN 4135.

LEN 4161 Fire Investigation and Arson (Intensive) (6 q.h.)
Same as LEN 4140 and LEN 4141.

LEN 4162 Correctional Administration (Intensive) (6 q.h.)
Same as LEN 4115 and LEN 4116.

LEN 4163 Administration of Justice (Intensive) (6 q.h.)
Same as LEN 4132 and LEN 4133.

LEN 4165 Security Administration (Intensive)
(6 q.h.)
Same as LEN 4144 and LEN 4145.

LEN 4300 Human Rights in Corrections
(3 q.h.)

Practices and problems involved in protecting human rights in the institutional environment, including legal and practical aspects.

LEN 4302 Correctional Counseling (3 q.h.)
Basic counseling concepts and principles, individual and group therapy carried on in the correctional field, and institutional services. Case studies and projects.

LEN 4305 Advanced Correctional Practices I
(3 q.h.)
Diagnosis and treatment of the drug addict and the alcoholic offender at both juvenile and adult levels; related kinds of self-abuse.

LEN 4306 Advanced Correctional Practices 2
(3 q.h.)
Correction-psychiatric facilities for the disorderly offender, including the aggressive, the assaultive, and the violent subject. Includes case studies of confined persons and their past and present environments. *Prereq.* LEN 4305.

LEN 4308 Comparative Correctional Systems
(3 q.h.)
Correctional systems and methods in selected jurisdictions. Examines organization, administration, and practices in the United States and foreign countries.

LEN 4311 Research Methods in Criminal Justice (3 q.h.)

Research project related to a specific police or correctional interest or operation, in consultation with the faculty advisor. Course meets at discretion of the instructor. Project paper required.

LEN 4312 Treatment of Offenders I (3 q.h.)
The concept of treatment and corrections, including history, classification, training, education and guidance, treatment methods, inmate society, and health and social services.

LEN 4313 Treatment of Offenders 2 (3 q.h.)
Therapy, psychiatric and psychological considerations, case studies, and evaluation of comparable methods. *Prereq.* LEN 4312.

LEN 4314 Police Supervision (3 q.h.)

The police supervisor's role in discipline and interdepartmental relations; problem handling and personnel policies; problems in supervisory relationships; and wages, grievances, morale, and safety.

LEN 4315 Criminology I (3 q.h.)

Introduction to the study of crime from the perspective of classical and contemporary criminological theories. Pays particular attention to biological, psychological, and sociological approaches to understanding crime.

LEN 4316 Criminology 2 (3 q.h.)

Continuation of LEN 4315, emphasizing the causes of crime and the relationship between law and crime. Considers the implications of prevention, rehabilitation, and treatment. *Prereq.* LEN 4315.

LEN 4317 Probation and Parole Practices I (3 q.h.)

The probation officer, pre-sentence investigation, conditions of probation, effectiveness and administrative aspects of probation and parole, methods of predicting their success, and the role of the community.

LEN 4318 Probation and Parole Practices 2 (3 q.h.)

The parole officer; conditions of parole; supervision; effectiveness; administrative relationships; role of the community, court, and law enforcement agencies; relations of probationer and parolee to rehabilitative, social, and family services; recidivism and aftercare. *Prereq.* LEN 4317.

LEN 4319 Law Enforcement Management and Planning I (3 q.h.)

Philosophy and theories of management in law enforcement and studies of organization from the administrator's viewpoint, including control, efficiency, effectiveness, and discipline.

LEN 4320 Law Enforcement Management and Planning 2 (3 q.h.)

The administrator's role, including special activities and responsibilities. Covers administrative planning; civilian personnel, including recruitment, selection, and evaluation; training; budgets; management records; interpersonal communications; auxiliary services; and evaluation of present and future management systems. *Prereq.* LEN 4319.

LEN 4322 Physical Security I (3 q.h.)

Basic foundations of security in industry, banking, transportation, utilities, and other nongovernment operations, including physical requirements and standards.

LEN 4323 Physical Security 2 (3 q.h.)

Implementation of security, including study of the inanimate aspects of protection, such as alarm and surveillance devices. *Prereq.* LEN 4322.

LEN 4335 Organized Crime Seminar (3 q.h.)

The nature and problems of organized crime, its causes and effects, comparative and historic roots, and activities, organization, and economics. Considers possible solutions and the scope of techniques used in combating organized crime.

LEN 4338 Forensic Laboratory Seminar (3 q.h.)

Crime laboratory organization and use of special equipment for the analysis, interpretation, classification, and identification of physical evidence obtained in crime-scene searches. Transportation, storage, and security of physical evidence and its implications, coupled with the preparation of exhibits for courtroom presentation. *Prereq.* LEN 4111.

LEN 4340 Civil Liberties and the Police I (3 q.h.)

In-depth preparation for the officer facing the practical problems of enforcing the law without breaching the civil rights of the accused and of bystanders. Readings, lectures, discussions, and examination of cases. Constitutional interpretation and limitations are the guidelines for the course.

LEN 4341 Civil Liberties and the Police 2 (3 q.h.)

Several Supreme Court cases are followed from the time of the call through confrontation, arrest, examination in court, appeals, and direct statements about the problem by jurists of the highest court. The course concludes with the latest changes in criminal law and the Civil Rights Act. *Prereq.* LEN 4340.

LEN 4354 Law Enforcement Management and Planning (Intensive) (6 q.h.)

Same as LEN 4319 and LEN 4320.

LEN 4355 Criminology (Intensive) (6 q.h.)

Same as LEN 4315 and LEN 4316.

LEN 4356 Treatment of Offenders (Intensive) (6 q.h.)

Same as LEN 4312 and LEN 4313.

LEN 4357 Probation and Parole Practices (Intensive) (6 q.h.)

Same as LEN 4317 and LEN 4318.

LEN 4358 Advanced Correctional Practices (Intensive) (6 q.h.)

Same as LEN 4305 and LEN 4306.

LEN 4801 Honors Program I (4 q.h.)

Prereq. Program Director's approval.

LEN 4802 Honors Program 2 (4 q.h.)

Prereq. LEN 4801.

LEN 4803 Honors Program 3 (4 q.h.)

Prereq. LEN 4802.

LEN 4808 Independent Studies I (3 q.h.)

Faculty-guided research on individually selected topics relating to the criminal justice system.

LEN 4809 Independent Studies 2 (3 q.h.)

Continuation of faculty-guided research as described in LEN 4808. *Prereq.* LEN 4808.

LEN 4899 Field Work in Law Enforcement, Correctional Practices, and Security (6 q.h.)

Opportunity for students to become more familiar with their major through practice. To be arranged with Major Advisor prior to registration. *Prereq.* Major in Law Enforcement, Correctional Practices, or Security.

LIB 4310 Critical Research Tools (3 q.h.)

How to use basic reference materials to do a research project. Covers a wide variety of research tools to help students make the most effective use of available study time. Resources include dictionaries, encyclopedias, almanacs, yearbooks, atlases, newspapers, periodicals, indices, reviews, biographical sources, and newer formats, such as microfiche, computer banks, and film strips.

LIB 4321 Introduction to Reference Materials and Methods (3 q.h.)

Basic tools and methods for locating information. Includes evaluation of dictionaries, encyclopedias, gazetteers, atlases, handbooks, almanacs, directories, and indices.

LIB 4322 Reference Work in the Social Sciences (3 q.h.)

The scope and use of outstanding reference materials in the social sciences, including government publications. Includes resources from economics, education, political science, sociology, and allied fields. *Prereq.* LIB 4321 or equiv.

LIB 4323 Reference Work in the Humanities (3 q.h.)

Approaches to the solution of reference problems in the humanities, with special emphasis on literature. *Prereq.* LIB 4321.

LIB 4325 Business Research Tools (3 q.h.)

Assists the business student or professional in becoming familiar with and adept in the use of the most respected publications and information sources in the business community. Content relates to such areas as accounting, business law, computers, data bases, finance, marketing, and statistics. Reference assignments help students learn which sources to use and how to find and understand complex data.

LIB 4331 Descriptive Cataloging (3 q.h.)

Theory and practice of descriptive cataloging, introducing techniques for compiling author, corporate, and serial entries.

LIB 4332 Subject Headings and Classification (3 q.h.)

Introduction to Dewey Decimal Classification and Sears subject headings and further study of descriptive cataloging in book and nonbook materials. *Prereq.* LIB 4331 or equiv.

LIB 4333 Library of Congress Classification (3 q.h.)

The significant differences between the Library of Congress (LC) and Dewey Decimal systems of classification. Includes notes on original cataloging and techniques of classification within the LC scheme and exercises in the use of LC schedules and subject headings. *Prereq.* LIB 4331 or equiv.

LNA 4101 Elementary Arabic I (4 q.h.)

Introduction to the Arabic language and culture through speaking, reading, and some writing.

LNA 4102 Elementary Arabic 2 (4 q.h.)

Continuation of LNA 4101 with practice in elementary conversation, reading, and writing. *Prereq.* LNA 4101 or equiv.

LNA 4103 Elementary Arabic 3 (4 q.h.)

Continuation of LNA 4102, building the basic skills necessary to carry on a conversation. *Prereq.* LNA 4102 or equiv.

LNF 4101 Elementary French I (4 q.h.)

Essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary and idiomatic expressions.

LNF 4102 Elementary French 2 (4 q.h.)

Continuation of grammar study, with oral and written exercises. *Prereq.* LNF 4101 or equiv.

LNF 4103 Elementary French 3 (4 q.h.)

Reading of French prose of increasing difficulty, with written and oral exercises based on the materials read and practice in conversation. *Prereq.* LNF 4102 or equiv.

LNF 4104 Intermediate French I (4 q.h.)

Review of grammar, with practice in composition and conversation. *Prereq.* LNF 4103 or equiv.

LNF 4105 Intermediate French 2 (4 q.h.)

History of French civilization, with discussions and conversation. *Prereq.* LNF 4104 or equiv.

LNF 4106 Intermediate French 3 (4 q.h.)

Intensive reading of modern French prose, with practice in conversation. *Prereq.* LNF 4105 or equiv.

LNF 4801 French Directed Study I (4 q.h.)

Directed Study Option: When a University College student is unable to continue study of an upper-level language, or when a language course needed for a degree is not scheduled at appropriate intervals, arrangements can be made to take three directed studies for a total of 12 q.h. Course numbers for French Directed Study I, 2, 3 are LNF 4801, LNF 4802, LNF 4803; for Spanish, LNS 4801, LNS 4802, LNS 4803; and so forth. Petitions and procedural instructions are available from the Liberal Arts Program Office. *Allow at least six weeks to complete the petition process. Prereq.* 87 q.h.

LNF 4802 French Directed Study 2 (4 q.h.)

See LNF 4801.

LNF 4803 French Directed Study 3 (4 q.h.)

See LNF 4801.

LNG 4101 Elementary German I (4 q.h.)

Essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary and idiomatic expressions.

LNG 4102 Elementary German 2 (4 q.h.)

The more difficult points of grammar, particularly the uses of the subjunctive mood. *Prereq.* LNG 4101 or *equiv.*

LNG 4103 Elementary German 3 (4 q.h.)

Reading of simple German prose, with oral and written exercises based on material read. Conversation in German is encouraged. *Prereq.* LNG 4102 or *equiv.*

LNG 4104 Intermediate German I (4 q.h.)

Review of grammar, with practice in composition and conversation. *Prereq.* LNG 4103 or *equiv.*

LNG 4105 Intermediate German 2 (4 q.h.)

History of German civilization, with discussions and conversation. *Prereq.* LNG 4104 or *equiv.*

LNG 4106 Intermediate German 3 (4 q.h.)

Intensive reading of modern German prose, with practice in conversation. *Prereq.* LNG 4105 or *equiv.*

LNG 4801 German Directed Study I (4 q.h.)

See LNF 4801.

LNG 4802 German Directed Study 2 (4 q.h.)

See LNF 4801.

LNG 4803 German Directed Study 3 (4 q.h.)

See LNF 4801.

LNH 4101 Beginning Conversational**Hebrew I** (4 q.h.)

Acquisition of basic oral skills by introduction of the essentials of Hebrew grammar. Includes extensive practice in pronunciation and acquisition of an idiomatic core vocabulary.

LNH 4102 Beginning Conversational**Hebrew 2** (4 q.h.)

Continuation of LNH 4101, introducing Hebrew prose of moderate difficulty. *Prereq.* LNH 4101 or *equiv.*

LNH 4103 Beginning Conversational**Hebrew 3** (4 q.h.)

Continuation of LNH 4102. Continued emphasis on conversation and on building a solid vocabulary. *Prereq.* LNH 4102 or *equiv.*

LNI 4101 Elementary Italian I (4 q.h.)

Essentials of grammar, practice in pronunciation, and

progressive acquisition of a basic vocabulary and idiomatic expressions.

LNI 4102 Elementary Italian 2 (4 q.h.)

Continuation of grammar study, with oral and written exercises. *Prereq.* LNI 4101 or *equiv.*

LNI 4103 Elementary Italian 3 (4 q.h.)

Reading of Italian prose of increasing difficulty, with written and oral exercises based on the material read and practice in conversation. *Prereq.* LNI 4102 or *equiv.*

LNI 4104 Intermediate Italian I (4 q.h.)

Review of grammar, with practice in composition and conversation. *Prereq.* LNI 4103 or *equiv.*

LNI 4105 Intermediate Italian 2 (4 q.h.)

History of Italian civilization, with discussions and conversation. *Prereq.* LNI 4104 or *equiv.*

LNI 4106 Intermediate Italian 3 (4 q.h.)

Intensive reading of modern Italian prose, with practice in conversation. *Prereq.* LNI 4105 or *equiv.*

LNI 4801 Italian Directed Study I (4 q.h.)

See LNF 4801.

LNI 4802 Italian Directed Study 2 (4 q.h.)

See LNF 4801.

LNI 4803 Italian Directed Study 3 (4 q.h.)

See LNF 4801.

LNJ 4101 Elementary Japanese I (4 q.h.)

Basic, practical Japanese, emphasizing the essentials of grammar, pronunciation, progressive acquisition of a core vocabulary, and the use of current, idiomatic expressions.

LNJ 4102 Elementary Japanese 2 (4 q.h.)

Continuation of LNJ 4101. Progressive acquisition of practical skills. *Prereq.* LNJ 4101 or *equiv.*

LNJ 4103 Elementary Japanese 3 (4 q.h.)

Continuation of LNJ 4102. *Prereq.* LNJ 4102.

LNL 4101 Beginning Latin I (4 q.h.)

Grammar needed for reading elementary Latin prose as well as for understanding some basic etymologies. Recommended for those interested in enriching their knowledge of English and Romance languages and those who want to read classical literature in the original.

LNL 4102 Beginning Latin 2 (4 q.h.)

Continuation of LNL 4101. *Prereq.* LNL 4101.

LNL 4103 Beginning Latin 3 (4 q.h.)

Continuation of LNL 4102. *Prereq.* LNL 4102.

LNL 4801 Latin Directed Study I (4 q.h.)

See LNF 4801.

LNL 4802 Latin Directed Study 2 (4 q.h.)

See LNF 4801.

LNL 4803 Latin Directed Study 3 (4 q.h.)

See LNF 4801.

LNN 4101 Beginning Conversational Swedish I (4 q.h.)

Acquisition of basic oral skills by introduction of the essentials of Swedish grammar, with extensive practice in pronunciation and acquisition of an idiomatic core vocabulary.

LNN 4102 Beginning Conversational Swedish 2 (4 q.h.)

Continuation of LNN 4101, introducing Swedish prose of moderate difficulty. *Prereq.* LNN 4101 or *equiv.*

LNN 4103 Beginning Conversational Swedish 3 (4 q.h.)

Continuation of LNN 4102. *Prereq.* LNN 4102 or *equiv.*

LNN 4801 Swedish Directed Study I (4 q.h.)

See LNF 4801.

LNN 4802 Swedish Directed Study 2 (4 q.h.)

See LNF 4801.

LNN 4803 Swedish Directed Study 3 (4 q.h.)

See LNF 4801.

LNS 4101 Beginning Conversational Spanish I (4 q.h.)

Acquisition of basic oral skills by introduction of the essentials of Spanish grammar. Extensive practice in pronunciation and acquisition of an idiomatic core vocabulary.

LNS 4102 Beginning Conversational Spanish 2 (4 q.h.)

Continuation of LNS 4101, introducing Spanish prose of moderate difficulty. *Prereq.* LNS 4101 or *equiv.*

LNS 4103 Beginning Conversational Spanish 3 (4 q.h.)

Continuation of LNS 4102. Continued stress on conversation, while building a solid vocabulary. *Prereq.* LNS 4102 or *equiv.*

LNS 4104 Intermediate Spanish I (4 q.h.)

Review of grammar, with practice in composition and conversation. *Prereq.* LNS 4103 or *equiv.*

LNS 4105 Intermediate Spanish 2 (4 q.h.)

Examination of Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation and conversation practice based on assigned readings. *Prereq.* LNS 4104 or *equiv.*

LNS 4106 Intermediate Spanish 3 (4 q.h.)

Examination of Spanish-American civilization through texts of average difficulty. Intensive readings of modern prose, with occasional oral or written translations and conversation practice based on assigned readings. *Prereq.* LNS 4105 or *equiv.*

LNS 4801 Spanish Directed Study I (4 q.h.)

See LNF 4801.

LNS 4802 Spanish Directed Study 2 (4 q.h.)

See LNF 4801.

LNS 4803 Spanish Directed Study 3 (4 q.h.)

See LNF 4801.

MGT 4101 Introduction to Business and Management I (3 q.h.)

The setting and general structure of American business, including objectives and practices affecting the American standard of living. Examines the characteristics of private enterprise and the nature and challenge of capitalism and other forms of economic enterprise. Introduces types of businesses, the structures of organizations, and the functions of management as well as what a managerial career involves, what problems must be faced, and what decisions must be reached.

MGT 4102 Introduction to Business and Management 2 (3 q.h.)

Methodologies in planning, organizing, directing, and controlling production, marketing, sales, and pricing within the American free enterprise system and in contrast to other business systems. Examines techniques for coping with the intricacies of systems management. *Prereq.* MGT 4101.

MGT 4103 Introduction to Business and Management 3 (3 q.h.)

Basic management concepts and techniques necessary to successful decision making. Emphasizes management as a continuous, active process by introducing methods of designing an organization; understanding and dealing with people; evaluating the political, social, and economic environment; and effectively planning, directing, and controlling an organization. *Prereq.* MGT 4102.

MGT 4105 Introduction to Business and Management (Intensive) (6 q.h.)

Same as MGT 4101 and MGT 4102.

MGT 4110 Survey of Business and Management (4 q.h.)

Introduction to the setting and general structure of American business, the characteristics of private enterprise, and the nature and challenge of capitalism and other forms of economic enterprise. Covers the forms of business, organizational structure, and functions of management. Through lectures and class discussion, students are given an overview of the methodologies used in planning, organizing, directing, and controlling the functions of production, marketing, sales, pricing, and finance. *For Alternative Freshmen only.*

MGT 4310 Project Management Process: Planning and Implementation (formerly Project Planning and Control) (3 q.h.)

The entire process of implementing a project, from project definition to the evaluation of feasibility, scheduling, and financial and budgetary factors. Manage-

ment techniques and requirements are used in case analyses, along with the concept of using computer software to help oversee projects. *Prereq.* IM 4301.

MGT 4320 Managing Change (3 q.h.)

Application of managerial concepts and practices to real-world situations with policy or resource constraints. Explores decision making related to the impact of change on the organization and its personnel and develops a conceptual framework for handling change in one's own business career. *Prereq.* MGT 4103.

MGT 4323 Motivation Management (3 q.h.)

Designed to help students differentiate between the managerial position as such and a leadership role, evaluating the impact of leadership and management styles on human behavior. Introduces and analyzes important motivation concepts through study of the working environment and the processes that influence both performance and outcome. Includes readings from contemporary behavioral scientists and individual research projects, with reports for group discussion and analysis. *Prereq.* MGT 4103.

MGT 4324 Essentials for Managers of Small Businesses (2 q.h.)

Essentials of small business management, including employee motivation, financial planning, marketing, and strategic planning.

MGT 4325 Entrepreneurship and Small Business Management I (3 q.h.)

Introduction to the major aspects of managing a small business. Covers the basic elements of entrepreneurship and the initial phases of planning, including legal, financial, marketing, organizational-control, and management functions. *Prereq.* MGT 4102.

MGT 4326 Entrepreneurship and Small Business Management 2 (3 q.h.)

Continuation of MGT 4325 for advanced business students. Emphasizes developing business plans, analyzing performance, identifying problems, maintaining financial health, and planning for the future. Includes discussion of actual cases involving small businesses. *Prereq.* MGT 4325.

MGT 4327 Entrepreneurship and Small Business Management (Intensive)

(6 q.h.)
Same as MGT 4325 and MGT 4326. *Prereq.* MGT 4102.

MGT 4330 Small Business Management (3 q.h.)

For small business entrepreneurs or persons interested in running a small business. Covers fundamental business concepts, including ownership forms; ongoing market research, capitalization, and management and operating issues; personnel and benefits; risk management; tax considerations; operating finances; and small business strategic positioning. Generally offered in six half-day sessions.

MGT 4350 Business Policy I (3 q.h.)

For advanced students building on all previous management courses and on numerous functional and procedural courses. Examines the total management process from formulating to implementing strategy and discusses the development of corporate objectives, plans, and policies, emphasizing the interaction between the enterprise and its environment. The economic and social responsibilities of business and managers are also considered. *Prereq.* 100 q.h. and completion of all core courses in business.

MGT 4351 Business Policy 2 (3 q.h.)

Organizational and administrative methods for converting plans into achievements. Explores concepts of strategic planning and implementation from the perspective of the general manager, with attention to top management functions, responsibilities, styles, values, and organizational relationships. Includes cases from profit and nonprofit enterprises of various types. *Prereq.* MGT 4350.

MGT 4352 Business Policy (Intensive) (6 q.h.)

Same as MGT 4350 and MGT 4351. *Prereq.* 100 q.h.

MGT 4355 Manager and Society (3 q.h.)

For managers, potential managers, and others interested in the national and international issues confronting business and industry in their relationships with governments, societies, and individuals. Includes issues of changing work environments and the variety of influences and pressures that need to be taken into account when making socially responsible business decisions. *Prereq.* MGT 4350.

MGT 4356 International Business Management and Operations (3 q.h.)

Principles and practices of international business, comparing domestic and international business activities, responsibilities, and influences. Explores the economic, social, political, and legal contexts of conducting business in a multinational environment and examines how the "foreign" factor in the business equation influences behavior. *Prereq.* MGT 4350.

MGT 4358 Contemporary Management Issues (3 q.h.)

Local, regional, national, and international business and management issues affecting today's management decisions. Includes upcoming changes in our economic system and the economy; corporate culture; social responsibility; ethics; worker needs, motivation, and satisfaction; demographics; and management-labor interactions. *Prereq.* MGT 4103.

MGT 4360 Management Seminar I (3 q.h.)

Capstone course requiring individual and/or group investigation and analysis of a substantive management issue. Projects should involve broad, interdisciplinary knowledge and experience, use a variety of research techniques, and be original in analysis and conclusions. Topics to be selected with the advice and approval of the instructor. *Prereq.* MGT 4351.

MGT 4361 Management Seminar 2 (3 q.h.)

Continuation of MGT 4360. *Prereq.* MGT 4360.

MGT 4362 Advanced Management Seminar (3 q.h.)

Continuation of group projects from MGT 4360 and MGT 4361. The project must be of major management significance, involving research of a management issue, a management audit, or an organizational analysis, usually of a real company. Enrollment is limited; both enrollment and the project must be approved by the Area Consultant and the Program Director. *Prereq.* MGT 4361.

MIS 4101 Introduction to Data Processing and Information Systems I (3 q.h.)

Introduction to data processing and computers, including an overview of data processing history, business data processing concepts, data processing organization, computer hardware, the internal representation of data, and data communications concepts.

MIS 4102 Introduction to Data Processing and Information Systems 2 (3 q.h.)

Continuation of MIS 4101, concentrating on software and systems. Includes the systems-development life cycle, programming tools and program preparation, the use of computers for specific business applications, data-base management systems, and high-level programming and planning languages. Also introduces computer programming in BASIC. *Prereq.* MIS 4101.

MIS 4103 Introduction to Data Processing and Information Systems (Intensive) (6 q.h.)

Same as MIS 4101 and MIS 4102.

MIS 4220 Introduction to Programming in COBOL (3 q.h.)

Fundamentals of computer programming, along with COBOL (Common Business Oriented Language) and its divisions, data file structures, and verb actions. Students prepare and test several programs using the University computer system. *Prereq.* MIS 4102 or MIS 4103.

MIS 4221 COBOL Programming I (3 q.h.)

Beginning computer problem solving and programming using COBOL. Includes structured flow-charting and programming techniques, use of an editor for program generation, input/output record layouts, and basic concepts, such as COBOL divisions and verbs. Students prepare and test several programs using the University computer system. *Prereq.* MIS 4102 or MIS 4103.

MIS 4222 COBOL Programming 2 (3 q.h.)

Continuation of MIS 4221. Includes logic control breaks, creation of multipage reports, sign and class tests, verification of input data, and table handling (subscription and indexing). Students prepare and test

several programs using the University computer system. *Prereq.* MIS 4221.

MIS 4223 COBOL Programming 3 (3 q.h.)

Continuation of MIS 4222, including advanced programming techniques, such as the internal sort facility and indexed file processing. Students prepare and test several programs using the University computer system. *Prereq.* MIS 4222.

MIS 4225 COBOL Programming (Intensive) (9 q.h.)

Same as MIS 4221, MIS 4222, and MIS 4223. *Prereq.* MIS 4102 or MIS 4103.

MIS 4230 End User Software (3 q.h.)

The large and rapidly growing collection of software geared toward the needs of the nontechnical end user. Includes discussion of various software packages, such as spread sheets, data bases, and graphics, for use on both mainframe and personal computers. *Prereq.* MIS 4102.

MIS 4235 Advanced COBOL Programming (3 q.h.)

Several kinds of programming disciplines for the COBOL programmer. Techniques include STRING and UNSTRING; CALL subroutines; tab handling with 1, 2, and 3 dimensions; indexed sequential access methods (SAM) for file processing; DEBUG; communications; and COPY library. *Prereq.* MIS 4223 or MIS 4225.

MIS 4240 Introduction to Programming in BASIC (3 q.h.)

Stand-alone introduction to computer programming using BASIC, one of the most popular programming languages for both personal and mini-computers. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4102.

MIS 4241 Programming in BASIC I (3 q.h.)

Introduction to computer programming using BASIC. Includes arithmetic operators, variables, expressions, arrays, functions, and formatted printing. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4102.

MIS 4242 Programming in BASIC 2 (3 q.h.)

Continuation of MIS 4241, covering more sophisticated BASIC programming techniques. Includes subroutines, nested loops, sorting, and file handling. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4240 or MIS 4241.

MIS 4250 FORTRAN Programming I (3 q.h.)

Introduction to computer programming using FORTRAN, a high-level language used primarily in scientific applications. Includes variables, constants, expressions, arithmetic operations, and looping. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4102.

MIS 4251 FORTRAN Programming 2 (3 q.h.)

Continuation of MIS 4250, covering more complex FORTRAN programming. Includes arrays, functions, and subroutines. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4250.

MIS 4252 FORTRAN Programming 3 (3 q.h.)

Continuation of MIS 4251, emphasizing applications and case studies. Students write a series of programs for scientific and business problems to gain proficiency in the FORTRAN language. Typical topics include simulation, sorting and merging, plotting, and financial analysis. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4251.

MIS 4253 FORTRAN Programming (Intensive) (9 q.h.)

Same as MIS 4250, MIS 4251, and MIS 4252. *Prereq.* MIS 4102.

MIS 4260 Assembly Programming I (3 q.h.)

Introduction to the VAX-11 Assembler running under the VMS operating system. Includes the binary representation of instructions and data, looping, instruction modification, indexing, indirect addressing, and data retrieval. Includes a brief survey of Assembly languages in general. *Prereq.* Demonstrated familiarity with any currently available computer language.

MIS 4261 Assembly Programming 2 (3 q.h.)

Continuation of MIS 4260. Includes addressing structures, floating-point techniques, coding, use of macro instructions, input-output routines, use of the operating system for job scheduling resource allocation, and file handling. *Prereq.* MIS 4260.

MIS 4262 Assembly Programming 3 (3 q.h.)

Continuation of MIS 4261. Includes advanced use of the operating system, divide independent file handling, and blocked and unblocked file manipulation. *Prereq.* MIS 4261.

MIS 4270 PASCAL Programming I (3 q.h.)

Introduction to computer programming using the PASCAL language. Includes arrays of records, text files, record files, and procedures and functions. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4102.

MIS 4271 PASCAL Programming 2 (3 q.h.)

Continuation of MIS 4270, covering more sophisticated PASCAL features. Includes multidimensional arrays, recursion, file sorting and merging techniques, sets, and structures. Students write, debug, and run a number of programs on the computer. *Prereq.* MIS 4270.

MIS 4273 PC DOS and Assembly (3 q.h.)

Introduction to the Disk Operating System (DOS), a collection of programs that manages the activities among personal computer components. The Personal Computer (PC) Assembly language is also discussed.

Students have the opportunity to write a small Assembly language routine and one or more DOS batch routines. *Prereq.* MIS 4102.

MIS 4276 Programming in C (3 q.h.)

Introduction to programming in C, originally developed at Bell Laboratories and most notably associated with the UNIX operating system. Students learn how to write programs in C and solve specific problems using the University's computer system. *Prereq.* Knowledge of at least one other programming language.

MIS 4280 Computer Operating Systems I

(3 q.h.)

For those familiar with data processing equipment and interested in developing, evaluating, and using systems programs. Examines the full range of features available in a variety of computer operating systems in terms of structure and form. Compares and presents operating systems implementation techniques employed by different computer manufacturers, with emphasis on their value as tools for application program development. References are generally to IBM operating systems, but also to other manufacturers, including Digital, Data General, and various personal computer manufacturers. *Prereq.* MIS 4220 or MIS 4221.

MIS 4281 Computer Operating Systems 2

(3 q.h.)

Building on concepts and techniques presented in MIS 4280, introduces distributed systems and networking software, a variety of data base systems, and the UNIX operating system. Includes discussions of local and wide-area networking systems and operating systems features. Expands data management as an operating systems feature to include data-base systems available from various computer manufacturers and software suppliers. *Prereq.* MIS 4280.

MIS 4301 Structured Systems Analysis and Design I (3 q.h.)

Systems analysis and design cycle, with emphasis on the analysis phase. Includes the history and life cycle of business information systems, the role of the systems analyst, analytical tools useful to the systems study process, development of feasibility studies, and presentation of study phase findings. *Prereq.* MIS 4102.

MIS 4302 Structured Systems Analysis and Design 2 (3 q.h.)

Continuation of MIS 4301, emphasizing the design phase. Includes detailed systems design procedures and techniques, system testing, specification and procedure writing, documentation, design of auditing and control procedures, performance measurement techniques, hardware and software selection and planning, and project management. *Prereq.* MIS 4301.

MIS 4305 Structured Systems Analysis and Design (Intensive) (6 q.h.)

Same as MIS 4301 and MIS 4302.

MIS 4307 Communications and Networking (3 q.h.)

Communications, networking, and distributed processing approached from the user's point of view rather than the designer's. Includes the economics of distributed processing, communications concepts, local-area networks, and vendor selection. *Prereq.* MIS 4302.

MIS 4340 Mini-Computers in Business I (3 q.h.)

Relevant to non-MIS business majors as well as students with a systems or EDP focus. Includes analysis of cost/performance; systems consideration of mini-computers versus alternatives and their role in applications such as time sharing; intelligent terminals; data entry and gathering; and data communications. Emphasizes evaluation of mini-computers as cost-effective elements of a business system. *Prereq.* MIS 4220 or MIS 4221.

MIS 4341 Mini-Computers in Business 2 (3 q.h.)

Development of systems specifications, functional configurations, systems tradeoffs, site preparation, and maintenance considerations. Includes detailed analysis of systems through specific case studies related to business applications. *Prereq.* MIS 4340.

MIS 4345 Data-Base Management Systems (3 q.h.)

Introduction to the data-base approach to design of integrated information applications. Covers the three methods of data-base design; data structures; diagramming; data definition languages; data manipulation languages; data-base implementation and evaluation; and the role of the data-base administrator. *Prereq.* MIS 4222, MIS 4230, and MIS 4302.

MIS 4348 Information Resource Management (3 q.h.)

Advanced information systems management, emphasizing planning, organizing, and controlling the corporate information resource. Includes personnel career planning, turnover, facilities and capacity planning, the user interface, standards development, RFP generation and vendor selection, hardware and software conversion problems, and disaster recovery. *Prereq.* MIS 4345.

MIS 4350 Auditing Data Processing (3 q.h.)

EDP audit techniques, programming, and operations, emphasizing EDP standard practices, procedures, documentation, and safety and security. Defines EDP business risks and related exposures, such as fraud, embezzlement, misuse or destruction of company assets, and business interruption. Also discusses the EDP portion of accounting requirements of the Foreign Corrupt Practices Act of 1977. Course content is oriented toward EDP managers, internal auditors, and public accountants. *Prereq.* MIS 4102.

MIS 4355 Information Processing in Medicine (3 q.h.)

Nontechnical survey of the impact and potential of computers in medicine, including medical records, clinical reporting systems, automated laboratories, on-line monitoring, research needs, and medical administration requirements. Analyzes the content and interactions of medical information subsystems and the implications of computerization of various medical activities. Examines equipment selection and organizational considerations. *Prereq.* MIS 4101.

MIS 4360 Computer Privacy and Security (3 q.h.)

Threats posed by and to modern electronic computers and their users. Includes a review of the issue of privacy and approaches, techniques, and tools used to safeguard computers. Uses actual case studies of computer abuse. *Prereq.* MIS 4102.

MIS 4385 Applied MIS Development Project (3 q.h.)

Capstone systems course integrating knowledge and abilities gained through other computer-related courses in the curriculum, within a comprehensive systems development project. *Prereq.* MIS 4348.

MKT 4301 Introduction to Marketing I (3 q.h.)

The planning necessary for effective marketing of consumer and industrial products and services in both commercial and nonprofit organizations. Includes an introduction to planning related to products, pricing, promotion, and distribution.

MKT 4302 Introduction to Marketing 2 (3 q.h.)

Continuation of MKT 4301, emphasizing applications of marketing theories and concepts. *Prereq.* MKT 4301.

MKT 4304 Introduction to Marketing (Intensive) (6 q.h.)

Same as MKT 4301 and MKT 4302.

MKT 4310 Advertising and Sales Promotion Management I (3 q.h.)

Advertising and sales promotion techniques as communications elements within a marketing strategy. *Prereq.* MKT 4302.

MKT 4311 Advertising and Sales Promotion Management 2 (3 q.h.)

Continuation of MKT 4310. Case studies and projects provide training in the development of creative advertising and promotion strategies and in the use of such communications media as television, radio, and print. *Prereq.* MKT 4310.

MKT 4312 Advertising and Sales Promotion Management (Intensive) (6 q.h.)

Same as MKT 4310 and MKT 4311. *Prereq.* MKT 4302.

MKT 4315 Sales Management I (3 q.h.)

The sales force as an element of marketing strategy. Includes selection, training, development, organization, and supervision of the sales force. *Prereq.* MKT 4302.

MKT 4316 Sales Management 2 (3 q.h.)

Continuation of MKT 4315, emphasizing the supervision and evaluation of the sales force. Also examines the role of personal selling within various marketing programs. Extensive use of case studies.

Prereq. MKT 4315.

MKT 4317 Sales Management (Intensive)

(6 q.h.)

Same as MKT 4315 and MKT 4316.

Prereq. MKT 4302.

MKT 4320 Marketing Management I (3 q.h.)

Advanced case-method course designed to help develop the ability to analyze and make decisions about problems involving the creation, distribution, and sale of goods and services. Emphasizes demand analysis and the development of product, pricing, promotion, and distribution policies. Includes information on how to establish and control marketing budgets. *Prereq.* MKT 4301.

MKT 4321 Marketing Management 2 (3 q.h.)

Continuation of MKT 4320, emphasizing the implementation of marketing strategy, the development of integrated marketing programs, and the role of the marketing manager. *Prereq.* MKT 4320.

MKT 4322 Marketing Management (Intensive)

(6 q.h.)

Same as MKT 4320 and MKT 4321. *Prereq.* MKT 4301.

MKT 4330 Marketing Research I (3 q.h.)

Use of marketing research in planning and evaluating marketing activities and in formulating marketing decisions. Introduces marketing information systems, primary and secondary research, quantitative and qualitative research, sampling techniques, and measurement processes. *Prereq.* MKT 4301.

MKT 4331 Marketing Research 2 (3 q.h.)

Techniques of data collection, processing, and analysis, emphasizing the reporting of research findings; using market research for demand measurement and forecasting; product research; advertising research; and test marketing. *Prereq.* MKT 4330.

MKT 4335 Public Relations I (3 q.h.)

Introduction to the basic principles, purposes, and practices of public relations in both commercial and nonprofit organizations. Emphasizes organization, research, and writing fundamentals.

MKT 4336 Public Relations 2 (3 q.h.)

Continuation of MKT 4335, emphasizing the development of public relations programs for specific publics. *Prereq.* MKT 4335.

MKT 4337 Introduction to Advertising (3 q.h.)

For nonbusiness majors, although business majors may take the course. Focuses on advertising, sales promotion, public relations, publicity, and personal selling as important elements in the marketing process. Also examines the ethical, social, and economic aspects of advertising and promotion.

MKT 4340 Retail Management I (3 q.h.)

Concepts and techniques of store operations and merchandise management. Focuses on the activities and contributions of various retailing institutions, such as independents, chains, dealerships, specialty stores, supermarkets, discount stores, and franchises. Also includes retail management, retail profit and loss, starting a retail business, store location, store planning, and the retail organization. *Prereq.* MKT 4301.

MKT 4341 Retail Management 2 (3 q.h.)

Continuation of MKT 4340, emphasizing store operations; merchandising planning, control, and management; pricing; buying; sales promotion; customer service; retail accounting; and expense management. *Prereq.* MKT 4340.

MKT 4352 Professional Selling Skills (Intensive)

(6 q.h.)
Opportunity to develop effective selling skills. Examines the customer buying process and the company sales process. Discusses prospecting, preparation, presentation, and post-sale activities and introduces advanced selling techniques, such as team selling. Focuses on situations where personal selling is a major element of marketing strategy, such as in industrial-product, professional-service, and high-technology marketing. *Prereq.* MKT 4302.

MKT 4355 High-Technology Marketing (3 q.h.)

The company's marketing function in transforming technology into products. Discusses planning for product innovation, linkages between marketing and engineering, and communications strategies for marketing high-technology products. *Prereq.* MKT 4302.

MKT 4358 Marketing and Sales Seminar

(3 q.h.)

Capstone marketing elective focusing on the formulation and implementation of overall marketing strategy. *Prereq.* MKT 4331.

MLS 4301 Medical Laboratory Science Orientation

(2 q.h.)
Scope, responsibilities, opportunities, and educational requirements for the medical laboratory science professions.

MLS 4321 Hematology (1 cl., 3 lab., 3 q.h.)

Basic hematological techniques, including discussion of the differential smear and observation of the normal morphology of human red cells, white cells, and platelets. *Prereq.* BIO 4104 or equiv. *Not open to medical technology or hematology majors.* (Laboratory fee)

MLS 4322 Morphologic Hematology I

(1 cl., 3 lab., 3 q.h.)

Morphologic and etiologic classification of the anemias. Related diagnostic tests are discussed. *Prereq.* HMG 4425 or equiv. (Laboratory fee)

MLS 4323 Morphologic Hematology 2

(1 cl., 3 lab., 3 q.h.)

Studies of pathologic and physiologic deviations of the white cells series as observed in leukemias and infections. Some animal hematology is included. *Prereq.* MLS 4322 or equiv. (Laboratory fee)

MLS 4341 Epidemiology I (3 q.h.)

Basic concepts in epidemiology, the distribution in determinants of diseases, and injuries in human populations. Descriptive and analytical epidemiology studies are included.

MLS 4342 Epidemiology 2 (3 q.h.)

Microbiological distributions in determinants of infectious diseases; hospital epidemiology.

MLS 4352 Basic MLS Electronics and Instrumentation (2 q.h.)

Electricity, with coverage of introductory electronic circuits. Emphasizes medical laboratory instrumentation and related electrical processes of measurement.

MLS 4365 Quality Control (3 q.h.)

Development of quality control programs in each medical laboratory specialty. Includes applications of statistical methods to medical laboratory quality control programs.

MLS 4381 Seminar in Medical Technology (3 q.h.)

Current topics in medical technology. Includes required readings and presentations by students; guest lectures. *Prereq.* Instructor's permission.

MLS Courses at Basic College Tuition Rate

Course descriptions for medical laboratory science courses numbered MLS 1... are available from the College of Pharmacy and Allied Health Professions, 206 Mugar Building.

MS 4325 Introduction to Modeling and Simulation (3 q.h.)

Modeling as a method for gaining insight into the underlying mathematical structure of business problems. Discusses specific modeling techniques, such as linear programming, PERT-CPM, and simulation. *Prereq.* MTH 4111.

MS 4332 Statistical Quality Control (3 q.h.)

Practical course in analytical methods modern quality controls. Emphasizes the application of basic statistical controls in the industrial environment. Includes control charts, statistical tolerancing, acceptance sampling techniques, life testing, and reliability concepts. *Prereq.* ECN 4251.

MS 4333 Management of Quality Control

(3 q.h.)

Management practices of modern quality control and the different approaches to optimizing quality. Includes organizational strategies, economics of quality, internal and external quality, and management of long-term quality and reliability. *Prereq.* MS 4332.

MS 4334 Advanced Quality Control (3 q.h.)

Quality control topics of current interest. Typical subjects include Asian quality methods, advanced process capability techniques, use of computers in quality control, and integration of quality and reliability programs. *Prereq.* MS 4333.

MS 4335 Principles of Material Inspection

(3 q.h.)

Bridges the gap between manufacturing and data analysis, with emphasis on the measuring process. In-class labs provide hands-on training in the use of a wide variety of mechanical measuring devices. Lectures demonstrate the fundamental measuring principles involved and illustrate their extension to all measuring processes.

MS 4336 Industrial Experimentation (3 q.h.)

Practical techniques for data collection that can greatly extend students' problem-solving skills. Includes instruction in extracting maximum information from small samples and avoiding many common data-analysis pitfalls. Other topics include randomized tests, multi-level tests, two-level multi-factor tests, and fractional tests. *Prereq.* ECN 4251 or equiv.

MS 4337 Principles of Quality Assurance

(3 q.h.)

The modern quality function from its beginnings in product design to vendor selection, incoming inspection, monitoring of the manufacturing process, final product testing, and customer acceptance. Includes defining quality, quality organization, sampling plans, control charts, and quality assurance reporting.

MTH 4001 Basic Mathematics I (3 q.h.)

Review of elementary algebra, including algebraic expressions and operations, equations, and word problems. *Credit for this course cannot be applied to School of Engineering Technology degree programs.*

MTH 4002 Basic Mathematics 2 (3 q.h.)

Further review of mathematics, including operations with polynomials, factoring, fractional expressions, and word problems. *Credit for this course cannot be applied to School of Engineering Technology degree programs.* *Prereq.* MTH 4001.

MTH 4081* Introduction to Mathematics I (4 q.h.)

Comprehensive review of high school algebra, including first-degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. *Credit for this course cannot be applied to the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree program.*

MTH 4082* Introduction to Mathematics 2 (4 q.h.)

Algebraic operations with complex fractions, mixed expressions, square roots, radicals, quadratic equations, simultaneous equations, graphs, and fractional zero and negative exponents; the geometry of the right triangle; areas of polygons and circles; and loci problems. *Credit for this course cannot be applied to the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree program. Prereq. MTH 4081*.*

MTH 4083* Applied Mathematics and Statistics (3 q.h.)

Use of mathematics as a guide for concise thinking and the application of mathematical methods to highlight significant data. Includes the use of elementary analytical models to test and evaluate hypotheses, the role of change in physical phenomena, the importance of the use of a relevant statistical model, and methods for the selection of a data base. *Prereq. MTH 4082* or equiv.*

MTH 4107* College Algebra I (4 q.h.)

Fundamental algebraic operations, complex numbers, radicals and exponents, functions, linear and quadratic equations, irrational equations, inequalities, variation, and roots of polynomial equations. *Prereq. Math Placement Test or MTH 4082*.*

MTH 4108* Introduction to Calculus (4 q.h.)

Logarithms, trigonometric functions of angles in degrees and radians, trigonometric identities and equations, right triangles, oblique triangles, complex numbers in trigonometric form, systems of equations, and determinants. *Prereq. MTH 4107* or MTH 1107.*

MTH 4110 Mathematics I (3 q.h.)

The real number system, exponents, polynomials, factoring, radicals, algebraic fractions, complex fractions, linear equations, and word problems. *Prereq. One year of high school algebra or its equiv. A placement test is given during the first class meeting. Students who obtain an unsatisfactory score on this test are advised to enroll in MTH 4001 instead for additional preparation.*

MTH 4111 Mathematics 2 (3 q.h.)

Linear inequalities, letter equations, quadratic equations and related problems, graphs and functions, and systems of equations. *Prereq. MTH 4110.*

*This is a School of Engineering Technology course, offered at a different tuition rate from that of University College.

MTH 4112 Mathematics 3 (3 q.h.)

Exponential and logarithmic functions, sequences, and series. Introduction to calculus. *Prereq. MTH 4111.*

MTH 4113 Mathematics (Intensive) (9 q.h.)

Same as MTH 4110, MTH 4111, and MTH 4112.

MTH 4114 Mathematics I and 2 Combination (6 q.h.)

Same as MTH 4110 and MTH 4111.

MTH 4120* Calculus I (4 cl., 4 q.h.)

Plane analytic geometry; differentiation of algebraic functions; rate, motion, and maximum and minimum problems; deviations of high order; curve sketching; basics in functions, limits, and continuity. *Prereq. MTH 4108* or MTH 1108.*

MTH 4121* Calculus A (4 cl., 4 q.h.)

Applications of derivatives to curvesketching; antidifferentiation; the definite integral, with applications; calculus of nonalgebraic functions, including logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; L'Hospital's rule. *Prereq. MTH 4120* or MTH 1140.*

MTH 4130 Calculus for Nonengineers I

(3 q.h.)

Introductory calculus course for students in liberal arts, business administration, and other nonengineering curricula. Fundamentals of differential calculus, rules of differentiation, rates of change, graph sketching, and growth and decay function. *Prereq. MTH 4112 or equiv.*

MTH 4131 Calculus for Nonengineers 2

(3 q.h.)

Applications of differential calculus, including problems in optimization, velocity and acceleration, compound interest, population growth, and the fitting of equations to data. Introduction to integral calculus, areas, average values of functions, marginal cost and profit, and depreciation. *Prereq. MTH 4130.*

MTH 4132 Calculus for Nonengineers 3

(3 q.h.)

Calculus of trigonometric functions, techniques of integration, numerical methods, and differential equations. Applications include pricing, allocation of funds, present value of an investment, manufacturing efficiency, and product reliability. *Prereq. MTH 4131.*

MTH 4140 Mathematics for Business Management I (3 q.h.)

Mathematics topics applicable to business management, such as linear equations and inequalities, matrix algebra, linear programming, sets, and counting techniques. *Prereq. MTH 4112 or equiv.*

MTH 4141 Mathematics for Business Management 2 (3 q.h.)

Business applications of probability, decision theory, Markov chains, game theory, and competitive analysis. Prereq. MTH 4140.

MTH 4143 Mathematics for Business Management (Intensive) (6 q.h.)

Same as MTH 4140 and MTH 4141.

MUS 4100 Introduction to Music (3 q.h.)

Selected works from earliest times to contemporary styles. Primarily a survey and listening course, emphasizing styles, basic theory, forms, and the historical, social, and artistic periods each work represents.

MUS 4103 Music and Society (formerly Music as a Means of Social Expression) (3 q.h.)

The artist's involvement with the recurring social themes of self-image, the search for peace and understanding, personal relationships, and others. Examines paintings and literary works in addition to works by Beethoven, Schoenberg, Britten, and selected jazz composers.

MUS 4105 Music of the U.S.A. (3 q.h.)

American music from Puritan psalm singing to the present. Covers folk music of ethnic origin, concert music, ragtime, jazz, and contemporary styles.

MUS 4106 Women in Music (3 q.h.)

The historical role of women in music, as composers, performers, patrons, and inspirations.

MUS 4110 Music in Popular Culture (3 q.h.)

Investigation of American attitudes toward culture, art, and beauty through consideration of contemporary popular music. Compares the different styles of pop music (jazz, rock, MOR, and R&B) and traces their evolution. Examines the manipulation of public tastes by large corporations for commercial purposes.

MUS 4111 Rock Music (3 q.h.)

History of rock music from its origins in American blues and other styles through the popular music of the 1950s, the political styles of the 1960s, and the diverse trends of the 1970s. Emphasizes the formative years of rock.

MUS 4112 Jazz (formerly Jazz Evolution and Essence) (3 q.h.)

Jazz, from its origins in New Orleans to the avant-garde experiments of today. Includes analysis of the rhythmic, harmonic, instrumental, and stylistic characteristics of jazz. Covers the works of such creative jazz artists as Armstrong, Beiderbecke, Parker, Ellington, and Coltrane.

MUS 4120 History of Musical Styles (3 q.h.)

Chronological examination of Western music, including its role in society and the contributions of influential

composers. Reviews representative works from each period, with music by Bach, Handel, Haydn, Mozart, Beethoven, Brahms, Berlioz, Wagner, Mahler, and Stravinsky.

MUS 4121 Medieval and Renaissance Music (3 q.h.)

Development of sacred and secular monophony, vocal and instrumental works, and polyphonic music from their beginnings to about 1600.

MUS 4122 Music of the Baroque (3 q.h.)

The period of the emergence of the orchestra, the chorus, and the virtuoso performer and the development of the oratorio, opera, concerto, and symphony in the works of Monteverdi, Corelli, Vivaldi, Handel, and J. S. Bach.

MUS 4123 Music History of the Classical Period (3 q.h.)

Study of changing musical styles from Stamitz and the Mannheim School through the works of Haydn, Mozart, and early Beethoven.

MUS 4124 Music History of the Romantic Era (3 q.h.)

Musical styles of the nineteenth century, including the role of music and the musician in the changing social, economic, political, and cultural structure of Europe. Analyzes music by Beethoven, Schubert, Berlioz, Brahms, Verdi, and Wagner.

MUS 4125 Music History of the Twentieth Century (3 q.h.)

The diversity of styles from Debussy through Stravinsky, Schoenberg, Bartok, and Hindemith and more recent developments, including *musique concrete*, chance music, and electronic music.

MUS 4130 The Symphony (3 q.h.)

The symphony as the major genre in the Classical, Romantic, and contemporary periods. Works by Haydn, Mozart, Beethoven, Schumann, Tchaikovsky, Brahms, and Sibelius.

MUS 4132 The World of Opera (3 q.h.)

Opera as a dramatic form, including discussion of aria, recitative, ensemble, and other basic elements. Considers numbers opera, music drama, and *Singspiel* and such composers as Mozart, Wagner, Verdi, and Puccini.

MUS 4133 Great Choral Literature (3 q.h.)

Sacred and secular choral literature from medieval to contemporary times.

MUS 4136 Music and Art (formerly European Music and Art) (3 q.h.)

How European composers used the works of Spanish, English, and German painters as inspiration for their musical scores. Analyzes European museum paintings and their musical counterparts to give students an understanding of the broad influence of art on musical composition.

MUS 4137 Music of the Dance (3 q.h.)

The world of the dance, with emphasis on the creative art of ballet. Probes the dynamic qualities of music for the dance and the people who brought it to its present position as a fusion of all the arts.

MUS 4138 American Musical Theatre (3 q.h.)

Historical survey and analytical study of musical shows. Students attend performances and write critical reviews.

MUS 4140 Life and Works of Mozart (3 q.h.)

Mozart's musical development from child prodigy to mature artist, traced from his own letters and from biographies. Includes analysis of many of his major works, including operas, symphonies, concertos, and chamber music.

MUS 4141 Life and Works of J. S. Bach (3 q.h.)

The genius who summed up the Baroque era and whose every note reflected his profoundly humanistic approach to religion. Works examined include large choral masterpieces, such as the *St. Matthew Passion*, the *Brandenburg Concertos*, the *Well-Tempered Clavier*, and the *Suites*.

MUS 4144 Life and Works of Debussy (3 q.h.)

Debussy's impressionist music as the turning point toward modern trends. Studies much of his work for piano, orchestra, and opera, including *Suite Pour le Piano*, *Suite Bergamasque* ("Clair de Lune"), *Images* for piano and orchestra, *Nocturnes*, *La Mer*, and the opera *Pelleas and Melisande*.

MUS 4145 Life and Works of Beethoven

(3 q.h.)

The complex personality and art of this major figure, including his relation to the turbulent times in which he lived and his role in Classical and Romantic music.

MUS 4160 Music Therapy (3 q.h.)

Use of music as a therapeutic medium, designed for the musician and nonmusician alike. Course is experimental in nature and covers such topics as music language and the brain, music and special populations, and music and relaxation.

MUS 4165 The Music Industry (3 q.h.)

Business-related areas of the music industry. Includes the structure of the record industry and music publishing world, the function of performing rights organizations (ASCAP and BMI), and the role of concert and orchestral managers. Guest lecturers from various fields; trips to "behind-the-scenes" locations.

MUS 4180 Introduction to World Music (3 q.h.)

The varied musical cultures of non-Western societies. Exploration of characteristics common to all musical systems, followed by investigation of music in the Middle East, southern and eastern Asia, Africa, South and Central America, and the Caribbean.

MUS 4181 Music of Africa (3 q.h.)

The music of Africa is as varied as its many linguistic and tribal identities. Broad survey of African musical traditions and their historical, social, and cultural background as well as Africa's approaches to musical organization, musical practice, and significant aspects of style. Also examines the possible contributions to contemporary African-American music.

MUS 4182 Music of the Middle East (3 q.h.)

Introduction to the music and traditional instruments of selected Near Eastern and Arab cultures, such as Persian culture in the East and Ethiopian and Berber cultures in Africa. Also, cantillation styles and practices of various chants of the Hebrew, Christian, and Islamic traditions.

MUS 4200 How to Read and Write Music

(3 q.h.)

Basics of musical notation for students with little or no theory or performance background. Focuses on the use of the symbols of pitch and duration. Includes sight reading simple melodies, following scores, arranging music for small instrumental groups, transposition, and elementary rhythmic and melodic composition.

MUS 4201 Music Theory I (formerly

Fundamentals of Music Theory I) (4 q.h.)

Basics of music theory as a foundation for further musical study and activity. Begins with aural and visual identification of pitches, intervals, major and minor scales, and triads in the G and F clefs. Includes rhythmic and simple melodic dictation, sight reading, elementary melodic writing, and chord construction.

MUS 4202 Music Theory 2 (4 q.h.)

Visual identification of pitches in the soprano, alto, and tenor clefs; transposition; some elementary arranging; writing and aural identification of cadences; elementary musical analysis; melodic and rhythmic dictation; and sight reading. *Prereq.* MUS 4201 or equiv.

MUS 4203 Music Theory 3 (4 q.h.)

Continuation of MUS 4202. Elementary four-part writing, introduction to figured bass, score reading, and harmonic analysis. Activities include harmonic as well as melodic dictation and part singing by sight. *Prereq.* MUS 4202.

MUS 4231 Musical Performance I (1 q.h.)

Participation in rehearsals and public performances and/or research; and composition, arranging, conducting, and solo and ensemble activity with the NU Symphony Orchestra, the Early Music Players, the NU Chorus, the NU Bands, or other ensembles under the supervision of a faculty member. Evaluation of student progress at the end of the quarter by audition or other method. *Prereq.* Audition or instructor's permission.

MUS 4232 Musical Performance 2 (1 q.h.)

Continuation of MUS 4231. *Prereq.* MUS 4231.

MUS 4233 Musical Performance 3 (1 q.h.)

Continuation of MUS 4232. *Prereq.* MUS 4232.

MUS 4234 Musical Performance 4 (1 q.h.)

Continuation of MUS 4233. *Prereq.* MUS 4233.

MUS 4235 Chamber Music I (3 q.h.)

Weekly one-hour sessions for rehearsal, study, and performance of music for two to six players (matched according to level) under the guidance of a faculty coach. Repertoire selected from the full range of European concert music by the instructor in consultation with the students. Special tuition rate for Northeastern University staff. For details, contact the Department of Music, 307 Ell Building, 617-437-2440.

MUS 4236 Chamber Music 2 (3 q.h.)

Continuation of MUS 4235. *Prereq.* MUS 4235 or instructor's permission.

MUS 4237 Chamber Music 3 (3 q.h.)

Continuation of MUS 4236. *Prereq.* MUS 4236 or instructor's permission.

MUS 4241 Piano Class I (3 q.h.)

For beginning piano students who want to progress at their own pace. Grades are awarded after passing various step levels. Ownership of a piano is not required.

MUS 4242 Piano Class 2 (3 q.h.)

Introduction of scales, arpeggios, and triads to help students perform more advanced music. Repertoire consists of original compositions by the instructor and simple works by Bartok and Kabalevsky. *Prereq.* MUS 4241 or equiv., or instructor's permission.

MUS 4243 Piano Class 3 (3 q.h.)

Two-octave scales, arpeggios, and triads in all keys. Repertoire consists of Bartok, Kabalevsky, original compositions by the instructor, and duets specifically arranged for this course. *Prereq.* MUS 4242 or equiv., or instructor's permission.

MUS 4244 Voice Class (3 q.h.)

Basic vocal production required for fine singing. Repertoire, both classical and contemporary, is chosen for each student to learn and perform in lessons and outside of class. Includes lectures concerning diction, the physiology of singing, resonance, registers, interpretation, and the basics of music reading and sight-singing. Also includes class analysis of recordings of great vocal artists.

MUS 4247 Guitar Class I (3 q.h.)

Guitar for beginners. Covers basic classical guitar techniques, including proper sitting and hand positions, note reading, and ensemble playing. Instruments, preferably nylon-strung, are required.

MUS 4248 Guitar Class 2 (3 q.h.)

For those who have taken MUS 4247 or who already have a basic knowledge of classical guitar techniques and note reading. Introduces both solo and ensemble repertoire suitable to the advanced beginner. *Prereq.* MUS 4247 or instructor's permission.

MUS 4249 Guitar Class 3 (3 q.h.)

Continuation of MUS 4248, with repertoire suitable for early intermediate students. *Prereq.* MUS 4248 or instructor's permission.

MUS 4250 Conducting (3 q.h.)

How to develop a clear beat technique and prepare, teach, and polish a work in rehearsal. Provides exposure to a basic repertoire and the essentials of vocal-instrumental production. *Prereq.* Fundamental knowledge of music reading and concurrent membership in a performing ensemble.

MUS 4254 Music Tutorial I (3 q.h.)

Individual instruction in a musical instrument or in voice. Features weekly 45-minute lessons at any level, presenting suitable instrumental technique and repertoire. Those taking the course for credit are required to play an audition examination at the end of the quarter. Fee for individualized instruction; special rate for Northeastern University staff. For details, contact the Department of Music, 307 Ell Building, 617-437-2440.

MUS 4255 Music Tutorial 2 (3 q.h.)

Continuation of MUS 4254. *Prereq.* MUS 4254.

MUS 4256 Music Tutorial 3 (3 q.h.)

Continuation of MUS 4255. *Prereq.* MUS 4255.

MUS 4301 Form and Analysis (3 q.h.)

The principles of unity and variety in musical composition. Representative works from all periods of Western music are used to analyze and study such single-member forms as theme and variation, rondo, minuet and trio, sonata-allegro, passacaglia, canon, and fugue. *Prereq.* MUS 4203 or equiv.

MUS 4800 Directed Study I (3 q.h.)

Opportunity for qualified students to take an upper-level required course when the needed course is not available at the time recommended in the degree scheduling sequence. Petitions and procedural instructions are available in the Liberal Arts Program office. *Allow at least six weeks to complete the petition process.* *Prereq.* 87 q.h.

MUS 4801 Directed Study 2 (3 q.h.)

Second opportunity to do independent work as described in MUS 4800. *Prereq.* MUS 4800.

MUS 4810 Honors Program I (4 q.h.)

Independent work in a selected musical area under the direction of members of the department. Limited to qualified students with the approval of the

department chair and only by special arrangement with the supervising instructor.

Prereq. Program Director's approval.

MUS 4811 Honors Program 2 (4 q.h.)

Second opportunity to do independent work as described in MUS 4810. *Prereq. MUS 4810 and Program Director's approval.*

MUS 4812 Honors Program 3 (4 q.h.)

Additional opportunity to do independent work as described in MUS 4810. *Prereq. MUS 4811 and Program Director's approval.*

NUR 4300 Nursing Transition (9 q.h.)

The first nursing course for registered nurses in the bachelor's degree program, introducing program objectives and philosophy. Through guided and independent study, covers roles and role conflicts, communication, group dynamics, and the nursing process, specifically with patients experiencing the stresses of aging, chronic and long-term illness, and the presence of death. Also examines human nutritional needs, with emphasis on the aged and chronically ill. Registration by permission of the Academic Coordinator. *Prereq. BIO 4104, BIO 4177, BIO 4190, CHM 4113, and PSY 4112.*

NUR 4301 Psychiatric/Mental Health Nursing (7 q.h.)

Development of knowledge of mental and emotional illness through a basic understanding of the dynamics of human behavior and beginning skills in therapeutic intervention. Also introduces the concepts of family and group therapy and crisis intervention techniques. Registration by permission of the Academic Coordinator. *Prereq. NUR 4300.*

NUR 4302 Pharmacodynamics (3 q.h.)

For registered nurses. Introduces pharmacologic principles, the pharmacotherapeutics of drug groups, and individual drug substances of particular importance in the treatment and diagnosis of disease. *Prereq. CHM 4113.*

NUR 4400 Maternal and Child Nursing (9 q.h.)

Maintaining optimal health for child-bearing and child-rearing families from various cultural and social backgrounds. Students examine individuals at selected developmental stages. Provides opportunities to apply the nursing process in client-care settings and to assist families in coping with stresses that interfere with health. Registration by permission of the Academic Coordinator. *Prereq. NUR 4300, NUR 4302, and PSY 4241.*

NUR 4401 Medical-Surgical Nursing (9 q.h.)

Effects of acute illness on individuals, families, and society. Discusses alterations and adaptations in physiology characteristic of acute illness, the nurse's role, the impact of illness on living patterns, and the need for health education and continuity of care. Includes guided clinical experiences, emphasizing the nursing

process and the development of skills necessary to care for the acutely ill adult. Registration by permission of the Academic Coordinator. *Prereq. NUR 4300, NUR 4301, NUR 4302, and PSY 4241.*

NUR 4500 Community Health Nursing (9 q.h.)

Ways in which families, groups, and communities meet the health and welfare needs of their members, with particular attention to the nurse's role. Includes the political implications of health care delivery and current research affecting family and group health and community nursing. Laboratory experience involves work with individuals, families, and communities. Registration by permission of the Academic Coordinator. *Prereq. NUR 4300, NUR 4302, NUR 4400, NUR 4401, and PSY 4242.*

NUR 4501 Contemporary Nursing (5 q.h.)

For seniors. Current trends and issues in nursing and health care delivery. Students define their objectives, pursue an area of nursing in which they are particularly interested, and evaluate their own performance. Synthesizes major concepts through lectures, seminars, and student participation. Registration by permission of the Academic Coordinator. *Prereq. NUR 4301, NUR 4400, NUR 4401, and SOA 4102.*

NUR 4502 Introduction to Nursing Research (4 q.h.)

Builds on prior exposure to selected nursing studies. Covers qualitative and quantitative research and the value of each to nursing and the health care field. Also discusses the importance of nursing to both practitioner and consumer. *Prereq. NUR 4300, NUR 4301, NUR 4302, NUR 4400, and NUR 4401.*

PED 4200 Cardiovascular Health and Exercise (1 cl., 3 lab., 3 q.h.)

Structured exercise program meeting three times per week and offering a choice of jogging, swimming, or aerobic exercise classes and a weekly cardiovascular health lecture. Participants receive two comprehensive cardiovascular medical and physical fitness evaluations, one prior to and one at the completion of the program. Evaluations include a cardiopulmonary examination by a cardiologist, blood chemistry profile, pulmonary function testing, resting EKG, graded exercise treadmill (stress) test with EKG and blood pressure evaluation, assessment of percent body fat (ideal weight and projected weight loss where applicable), and functional assessment of the lower back. Each participant receives a computerized report; individual exercise programs are based on test results.

PHL 4100 Philosophical Thinking (formerly Philosophy: Methods and Values) (3 q.h.)

Methods and values of thinking philosophically. Reveals strategies of dialogue and of informational discovery through understanding and use of the Socratic method of intellectual exchange. Analyzes the universal quest for truth in order to distinguish between knowing and not knowing, dogma, and ignorance. Proves value issues through questions in ethics and moral philosophy.

PHL 4105 Philosophy of Knowing and Reality (3 q.h.)

The difference between knowledge and belief. Areas of theoretical focus include the nature of ultimate reality, the nature of human knowledge, and the nature and existence of God. The investigation of a variety of problems and alternative solutions helps students think independently and self-critically. Emphasizes the development of discipline and precision in communicating ideas.

PHL 4110 Philosophy of Right and Justice (3 q.h.)

Ethics and social and political philosophy. In ethics, addresses the questions "What sorts of things are good or bad?" and "What actions are right or wrong?" In social and political philosophy, examines theories of human nature, social change, social institutions, and major twentieth-century political theories. Possible additional topics include aesthetics and philosophy of history.

PHL 4165 Moral Problems in Medicine (3 q.h.)

Social and moral problems created by medical science. Questions investigated include "Should a human life be prolonged under any condition and at any cost?" "What are the moral problems caused by the current medical definitions of death?" "Is it morally right to predetermine the physical characteristics of future generations by genetic engineering?"

PHL 4170 The Human Search for Meaning (3 q.h.)

Examination of selected philosophical problems of human existence, such as freedom, death, sexuality, alienation, and becoming a person.

PHL 4180 Business Ethics (3 q.h.)

Ethical principles and considerations involved in making moral business decisions. Studies basic ethical viewpoints as a foundation; analyzes specific characteristics of business life through particular cases and examples.

PHL 4200 Logic (3 q.h.)

Essentials of lucid thinking in terms of basic logical concepts, including deductive and inductive reasoning, valid and invalid arguments, and the varied functions of language and definition. Also examines how to recognize and evaluate different kinds of arguments, methods of detecting and avoiding common errors in reasoning, and the link between structured thought and effective communication.

PHL 4220 The Meaning of Death (3 q.h.)

Various philosophical and religious views concerning the meaning of death. Discusses such questions as "What attitude should one take regarding one's own death?" "What role does death play in our personal relations to others?" "Is it necessary to believe in an afterlife in order to give meaning to this life?"

PHL 4223 Philosophy of Consciousness (3 q.h.)

Theories of consciousness, the possibility of higher states of consciousness, and some techniques, such as meditation, alleged to lead to higher states of consciousness. Readings may include psychological and parapsychological literature on the subject.

PHL 4230 Ethics in Theory and Practice (formerly Ethics I) (3 q.h.)

Major ethical theories, emphasizing ethical naturalism, utilitarianism, moral sense theories, intuitionism, and theological theories. Applications of these theories to real life are discussed and compared.

PHL 4231 Current Topics in Ethics (formerly Ethics 2) (3 q.h.)

Problems and issues encountered in important areas of moral concern, such as euthanasia, punishment, professional conduct, and moral responsibility in general. Explains various approaches to these problems within the framework of major ethical theories.

PHL 4243 Existentialism (3 q.h.)

Existential philosophy as understood through study of its greatest representatives, such as Kierkegaard, Nietzsche, Dostoyevsky, Heidegger, Jaspers, Camus, Sartre, and Merleau-Ponty. Focuses on the central themes of self-alienation, authenticity, and existential experiences.

PHL 4245 Philosophy of Religion (3 q.h.)

The arguments for the existence of God. Covers natural and moral evil, the soul, immortality, the evidence for miracles, and the nature of religious knowledge.

PHL 4247 Theistic, Atheistic, and Agnostic Philosophies (3 q.h.)

Selected theistic, atheistic, and agnostic philosophies. Some questions studied are "Is the belief in God necessary for a comprehensive philosophy of life?" "How does an atheistic philosophy explain and justify the 'higher values' such as love, beauty, and justice?" "How is it possible to base a philosophy on the principle of agnosticism?"

PHL 4249 Feminist Spirituality (3 q.h.)

Women's religious experience as described in classical and contemporary sources. Readings include such works as *Womanspirit Rising*, *The Politics of Women's Spirituality*, and *Dreaming the Dark*.

PHL 4250 Philosophy of Human Nature (3 q.h.)

Philosophical and literary study of human nature. "What is human nature?" "What is a human being?" Examines some of the philosophical answers to these questions, with special attention to the significance of tradition, social role, freedom, and decision.

PHL 4251 Images of Women in Philosophy (3 q.h.)

Philosophical approach to the study of women in society. Drawing from sources within the history of philosophy and literature, includes the role (ideal and actual) of women in society, love and marriage, oppression and isolation, and the cult of virginity.

PHL 4252 Feminist Ethics (3 q.h.)

The emerging feminist ethos as distinct from traditional descriptions of feminist morals and values. Discusses questions of politics, power, values, and actions. Readings include such works as DeBeauvoir's *The Ethics of Ambiguity* and Daly's *Gyn-Ecology*.

PHL 4255 Women and Religion (3 q.h.)

The role and place of women in the major religions of the world and contemporary feminist challenges to these traditional understandings. Readings include such works as Carmody's *Women and Religion* and Daly's *Beyond God the Father*.

PHL 4265 Contemporary Religious Issues in America (formerly Understanding Religion in America Today) (3 q.h.)

America's remarkable religious pluralism. Includes contemporary Christianity and Judaism, nontraditional Christian and non-Christian movements, cults, sects, and quasi-religious organizations. After becoming familiar with American religious foundations, students study the connections between religion and socio-technological change, sex, biomedical ethics, politics, and the media. May include guest speakers.

PHL 4266 The Religious Right in Contemporary America (3 q.h.)

Evangelism, fundamentalism, extremist groups, and nontraditional Jewish and Christian movements. Also examines "priesthood of all believers," grace and the idea of the "elect," and the state of being "born again" as well as the New Deal, the Great Society, and the "conservative revolution." Includes background on the roots of these movements, from precolonial Europe and Puritan America to the development of the Social Gospel. May include guest speakers.

PHL 4270 The Great Western Religions (3 q.h.)

Study of the basic teachings of Judaism, Christianity, and Islam.

PHL 4273 Judaism (3 q.h.)

Philosophy of the Jewish religion, its metaphysical and ethical beliefs, and the philosophical origins of these beliefs.

PHL 4275 The Great Eastern Religions (3 q.h.)

Study of the basic teachings of Taoism, Confucianism, Buddhism, Hinduism, and Shintoism.

PHL 4277 Hinduism (3 q.h.)

The Hinduism of the *Upanishads*, the most explicit of the mystical religions. Also includes the devotional aspect of Hinduism as expressed in the *Bhagavad Gita*.

PHL 4279 Buddhism (3 q.h.)

Central teachings of Buddhism, including the doctrines that there is no independently existing immutable self or soul, that all phenomena are impermanent, that existence is suffering, that suffering has a cause, and that there is a way to eliminate suffering.

PHL 4280 Islam (3 q.h.)

History of Islam, its conflicts with the West in the past and in the present, Islamic beliefs, and the future of Islam as a world religion.

PHL 4293 Mysticism: East and West (3 q.h.)

Inquiry into mystical experience through a comparative study of the writings of Christian, Buddhist, and Hindu mystics and of secondary interpretive sources. Explores the potential oneness of humanity with God, the conflict of mysticism with traditional forms of religion, and the possibility of a common, cross-cultural basis for mysticism.

PHY 4081* Introductory Physics I (4 cl., 4 q.h.)

Introduction to mechanics, including units of measurement, vectors, accelerated motion, and Newton's laws of motion. *Credit for this course cannot be applied to the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree program.*

PHY 4082* Introductory Physics 2 (4 cl., 4 q.h.)

Continuation of mechanics, conservation of energy and momentum, and introduction to elements of heat, thermodynamics, light, and electromagnetism. *Credit for this course cannot be applied to the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree program. Prereq. PHY 4081*.*

PHY 4104* General Physics I (2 cl., 2 q.h.)

Newtonian mechanics, kinematics and dynamics of particle motion, projectile and circular motion, and conservation laws of energy and momentum. *Prereq. MTH 4110 (or can be taken concurrently).*

PHY 4105* General Physics 2 (2 cl., 2 q.h.)

Temperature, heat energy, the mechanical equivalent of heat, wave motion, sound, Doppler's effect, elasticity and simple harmonic motion, rotational motion, and fluids at rest in motion. *Prereq. PHY 4104*.*

PHY 4106* General Physics 3 (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism, fields, potential, electric current, inductance, capacitance, electromagnetism, a-c and d-c series circuits, properties of light, and simple optical systems. *Prereq. PHY 4105*.*

POL 4103 Introduction to Politics (3 q.h.)

Introduction to contemporary political science, including consideration of basic concepts in political analysis,

*This is a School of Engineering Technology course, offered at a different tuition rate from that of University College.

the role of government institutions, political representation, political ideologies, and the scope and methods of political science.

POL 4104 Introduction to American Government (3 q.h.)

American governmental and political processes, constitutional institutions, political behavior, and liberties.

POL 4105 Introduction to Comparative Politics (3 q.h.)

Comparative study of constitutional and totalitarian systems, including the Western European and Soviet patterns.

POL 4106 Introduction to Politics (4 q.h.)

Basic political concepts and forces of organization from the classical Greeks to the modern nation-state. The Soviet Union and the United Kingdom are contrasted as contemporary illustrations of the institutional distinction between a totalitarian and a constitutional system. *For Alternative Freshmen only.*

POL 4110 The Great Political Thinkers (3 q.h.)

The great political thinkers from ancient Greece to the twentieth century. Probes the creative genius of such theorists as Plato, Aristotle, Aquinas, Hobbes, Hegel, Locke, Rousseau, Mill, and Marx.

POL 4300 Public Administration I (3 q.h.)

Introduction to the theory, forms, and processes of administration at the national and state levels.

POL 4301 Public Administration 2 (3 q.h.)

Case-study approach to examination of the relation between the theory and practice of public administration. *Prereq.* POL 4300 or *equiv.*

POL 4302 Public Administration (Intensive) (6 q.h.)

Same as POL 4300 and POL 4301.

POL 4303 Public Personnel Administration (3 q.h.)

Basic elements of personnel administration, including recruitment, training, classification, promotion, and executive development. Pays special attention to current problems, such as equal opportunity, public employee unionism, and collective bargaining. *Prereq.* POL 4301.

POL 4304 Public Budgeting (3 q.h.)

Politics, procedures, and goals of government budgeting at the federal, state, and local levels. Includes expense, capital, and program budgeting. *Prereq.* POL 4301.

POL 4305 Organizational Theory (3 q.h.)

People and organizations, focusing on organizational and societal problems as a way of understanding how we can survive in a bureaucratic system.

POL 4306 Public Policy Analysis (3 q.h.)

Procedures for the analysis of public policy, including discussion of selected cases of public policy at the local, state, or federal level. *Prereq.* POL 4301.

POL 4310 American Political Thought (3 q.h.)

Political thought from the Colonial period to the present, including study of the impact of religious, economic, and judicial theories on the structure of American ideas.

POL 4311 Research Methods (3 q.h.)

Introduction to some of the most common methods of conducting political science research. Includes problems of theory construction and data gathering and such analytical research tools as bibliographical aids and the computer.

POL 4312 Political Parties and Pressure Groups (3 q.h.)

Party government in the United States and Great Britain. A contrasting study focusing on the interaction of party and government.

POL 4313 State and Local Government

(formerly Government and Politics and the States) (3 q.h.)

State and local governments, their problems, and functional and operational responses to these problems.

POL 4314 Urban and Metropolitan Government (3 q.h.)

Political, structural, and functional problems of an urbanizing United States, including an analysis of urban, suburban, and metropolitan governments.

POL 4318 The American Presidency (3 q.h.)

The nation's chief executive. Includes the presidential electoral process, the president's many constituencies, and the differing styles of twentieth-century presidents. Also includes constitutional and extraconstitutional powers of the office.

POL 4319 The Legislative Process (3 q.h.)

Institutional and functional analysis of the roles of Congress, the chief executive, and political parties in the legislative process.

POL 4320 American Constitutional Law (3 q.h.)

Case analysis of the development of Federalism, the separation of powers, and the role of the federal and state courts in constitutional development.

POL 4321 Civil Liberties (formerly Civil Rights) (3 q.h.)

Quality and content of civil liberties in the United States. Emphasis is on the 1st, 5th, 6th, 14th, and 15th amendments to the Constitution.

POL 4322 Procedural Due Process (3 q.h.)

Study of due process in the American constitutional scheme.

POL 4330 Comparative Politics (3 q.h.)

Political culture, organization, and behavior in different national settings.

POL 4331 International Relations (3 q.h.)

Elements of and limitations on national power. Discusses contemporary world politics, problems of war, and peaceful coexistence.

POL 4332 International Organization (3 q.h.)

Development of international organizations, emphasizing the United Nations, specialized agencies, and regional organizations.

POL 4333 International Law (3 q.h.)

Procedural and substantive study of the legal relations among nation-states.

POL 4335 Formulating American Foreign Policy (3 q.h.)

The Constitution and political instruments for the formulation of American foreign policy.

POL 4336 American Foreign Policy (3 q.h.)

Study of recent and current American foreign affairs.

POL 4338 European Political Parties (3 q.h.)

Political party systems in England, France, and Germany, emphasizing ideology, organization in and out of Parliament, electoral strategies, and voter behavior.

POL 4339 Government and Politics in the Soviet Union (3 q.h.)

Modern totalitarian theory and practice, followed by study of the ideological and historical bases of the Soviet dictatorship. *Prereq.* POL 4330 or equiv.

POL 4341 Soviet Foreign Policy (3 q.h.)

Evolution of Soviet foreign policy since 1917, emphasizing the development of the international Communist movement.

POL 4342 Communism in Eastern Europe (3 q.h.)

Conditions and circumstances surrounding the establishment of Communist regimes in eastern Europe immediately after World War II and their relations with the Soviet Union. *Prereq.* POL 4330 or equiv.

POL 4350 Politics and Policies of the Developing Nations (3 q.h.)

Colonialism, the struggles for independence, and the common problems of developing nations. Includes economic development, urbanization, cultural fragmentation, and revolution. *Prereq.* POL 4330 or equiv.

POL 4352 Government and Politics of Latin America (3 q.h.)

Historical background of the Latin American nations and their cultural, economic, social, and political characteristics, including political violence and the breakdown of democratic governments. *Prereq.* POL 4330 or equiv.

POL 4356 Government and Politics of Northern Africa (3 q.h.)

Comparative analysis of political culture, organization, and behavior of African states north of the Sahara, with emphasis on Morocco, Algeria, Tunisia, and Egypt. *Prereq.* POL 4330 or equiv.

POL 4357 Government and Politics of Sub-Saharan Africa (3 q.h.)

Comparative analysis of political culture, organization, and behavior of African states south of the Sahara. *Prereq.* POL 4330 or equiv.

POL 4359 Government and Politics in the Middle East (3 q.h.)

Political change, economic growth, and social adaptation in selected countries of the Middle East. Also considers foreign policies, especially the ties of Middle Eastern countries with northern Africa. *Prereq.* POL 4330 or equiv.

POL 4362 Government and Politics of Southeast Asia (3 q.h.)

Political instability and problems of establishing democratic structures and processes in the Philippines, Thailand, and India. *Prereq.* POL 4330 or equiv.

POL 4364 China's Foreign Policy (3 q.h.)

Peking's relations with Africa, the rest of Asia, the Soviet orbit, and the West. Covers policy objectives, strategy, tactics, and the methods of decision making in both the party and state apparatus.

POL 4365 Government and Politics of China (3 q.h.)

Chinese political culture, emphasizing the nineteenth-century cultural, economic, and political impact of the West, the emergence of the Communist party under the leadership of Mao, and the progressive disintegration of Kuomintang leadership. *Prereq.* POL 4330 or equiv.

POL 4367 Government and Politics of Japan (3 q.h.)

Historical development of the Japanese nation, with particular attention to the growth of fascism and efforts to create a viable democracy since World War II.

POL 4370 Introduction to Political Theory (3 q.h.)

Development of the political ideas of the Western world, including the ideas of the major philosophers of Greece, Rome, the Christian Era, and the Renaissance.

POL 4371 Contemporary Political Theory (3 q.h.)

Political ideas and systems of political thought from Machiavelli to the present. *Prereq.* POL 4370 or equiv.

POL 4375 Consumer Advocacy I (3 q.h.)

Pragmatic course designed to define and expand the role of consumers in the marketplace. Focuses on contemporary consumer issues, touching upon the legal, social, economic, and political aspects of consumer

problems and the role of consumer lobbies as special interest groups. More specific consumer problems, such as those of the elderly, may also be explored.

POL 4376 Consumer Advocacy 2 (3 q.h.)
Continuation of POL 4375. *Prereq.* POL 4375 or equiv.

POL 4377 Consumer Advocacy 3 (3 q.h.)
Continuation of POL 4376. *Prereq.* POL 4376 or equiv.

POL 4378 Current Political Issues (3 q.h.)
Constitutional and political basis of selected problems in American political life.

POL 4830 Honors Program 1 (4 q.h.)
Independent work in a selected area under the direction of members of the department. Limited to qualified students with the approval of the department chair and only by special arrangement with the supervising instructor. *Prereq.* Program Director's Approval.

POL 4831 Honors Program 2 (4 q.h.)
Second opportunity to do independent work as described in POL 4830. *Prereq.* POL 4830 and Program Director's Approval.

POL 4832 Honors Program 3 (4 q.h.)
Additional opportunity to do independent work as described in POL 4830. *Prereq.* POL 4831 and Program Director's Approval.

POL 4840 Directed Study I (3 q.h.)
Opportunity for qualified students to take an upper-level course in their major on an individual basis. Petitions and procedural instructions are available in the Liberal Arts Program office, 617-437-2416. *Prereq.* 87 q.h. and Program Director's Approval.

POL 4841 Directed Study 2 (3 q.h.)
Opportunity to initiate a second individual study as described in POL 4840. *Prereq.* POL 4840 and Program Director's Approval.

PSY 4110 Fundamental Issues in Psychology (formerly Introduction to Psychology: Fundamental Issues) (3 q.h.)
Fundamental principles and issues of contemporary scientific psychology, approached as a method of inquiry as well as a body of knowledge. Examines the origins and methods of psychology, biological foundations of behavior, states of consciousness, learning, and memory.

PSY 4111 Developmental Aspects in Psychology (formerly Introduction to Psychology: Developmental Aspects) (3 q.h.)
Growth and the life cycle, language, mental abilities, sensory and perceptual processes, and social interaction. *Prereq.* PSY 4110 or equiv.

PSY 4112 Personal Dynamics in Psychology (formerly Introduction to Psychology: Personal Dynamics) (3 q.h.)
Motivation, emotion, personality theory and measurement, abnormal psychology, and therapy. *Prereq.* PSY 4110 or equiv.

PSY 4113 Introduction to Psychology Intensive A (formerly Psychology Intensive) (9 q.h.)
Same as PSY 4110, PSY 4111, and PSY 4112.

PSY 4114 Introduction to Psychology Intensive B (6 q.h.)
Same as PSY 4110 and PSY 4111.

PSY 4220 Statistics in Psychology I (3 q.h.)
Scales of measurement in psychological research, measures of central tendency, and variability. *Prereq.* PSY 4111 and PSY 4112 or equiv.

PSY 4221 Statistics in Psychology 2 (3 q.h.)
Measures of correlation, introduction to probability, and statistical distributions. *Prereq.* PSY 4220 or equiv.

PSY 4222 Statistics in Psychology 3 (3 q.h.)
Parametric and nonparametric tests of significance, including chi square, t-test, F test, and simple analysis of variance. *Prereq.* PSY 4221.

PSY 4231 Psychology of Learning I (3 q.h.)
Basic principles and techniques of operant and Pavlovian conditioning and their applications to therapeutic, educational, and specialized training programs. *Prereq.* PSY 4111 or PSY 4112 or equiv.

PSY 4232 Motivation (3 q.h.)
Various aspects of motivation, including primary and secondary reinforcement, unconscious motivation, effluence motivation, and the assessment of motives. *Prereq.* PSY 4112 or equiv.

PSY 4240 Development: Infancy and Childhood (formerly Developmental Psychology: Infancy and Childhood) (3 q.h.)
Human development from infancy through late childhood. Covers physical, cognitive, and psychosocial development, including the development of language, morality, and interpersonal relationships.

PSY 4241 Development: Adolescence (formerly Developmental Psychology: Adolescence) (3 q.h.)
Development during the second decade of life, emphasizing the tasks and problems confronting the individual adolescent. Includes biological, social, and cognitive changes as they relate to the creation of a stable, individual identity.

PSY 4242 Development: Adulthood and Aging (formerly Developmental Psychology: Adulthood and Old Age) (3 q.h.)
Unique features and problems of development from the adult years to death. Emphasizes changes that accompany career, marriage, and family developments and the specific psychological adjustments required of the aging person.

PSY 4243 Aging and Mental Health (3 q.h.)

Emotional reactions to age-related issues, such as retirement, bereavement, and health status. Depression and suicide, behavior disorders, substance use problems, and the dementias of old age and the effects these problems have on families and the community. Includes a survey of special assessment techniques, mental health services for the elderly, and public health policies for improved care.

PSY 4262 Cognitive Psychology (3 q.h.)

Mental processes involved in the acquisition, organization, and use of knowledge, including pattern recognition and memory. *Prereq.* PSY 4111, PSY 4112, or equiv.

PSY 4263 Psycholinguistics (3 q.h.)

The nature and structure of language, various theories of human production and perception of language, and related experimental findings. *Prereq.* PSY 4111 or equiv.

PSY 4270 Social Psychology I

(3 q.h.)

The socialization process, social motives, interpersonal perception, and group membership and structure. *Prereq.* PSY 4111 or equiv.

PSY 4271 Social Psychology 2 (3 q.h.)

Attitudes, prejudice and ethnic relations, leadership, mass behavior and social movements, and the effects of mass media on communication. *Prereq.* PSY 4270 or equiv.

PSY 4272 Personality I (3 q.h.)

The normal personality and its growth and development. Includes environmental and genetic contributions, assessment of personality, research, and a survey of the major personality theories. *Prereq.* PSY 4112 or equiv.

PSY 4290 Psychology of Women (3 q.h.)

Women, historically and in contemporary life, including their social roles and their behavior as determined genetically, physiologically, and psychologically. Examines implications for women's future lifestyles, roles, and contributions. *Prereq.* PSY 4111 or PSY 4112 or equiv.

PSY 4351 Physiological Psychology I (3 q.h.)

How nerves function and work together in the nervous system; how our sense organs provide the brain with information about the outside world; how the brain acts to produce behavior; and how such psychological concepts as perception, learning, motivation, arousal, and emotion may relate to nervous system activity. *Prereq.* PSY 4111 or PSY 4112 or equiv.

PSY 4352 Drugs and Behavior (3 q.h.)

Application of quantitative behavior techniques in animals and humans to determine the behavioral effects of pharmacological agents. Systematic survey of experimental literature. *Prereq.* PSY 4111 or PSY 4112 or equiv.

PSY 4370 Impact of Psychology on Society

(3 q.h.)

Developments such as the uses of intelligence and aptitude tests, psychosurgery and electroconvulsive therapy, techniques of behavior modification and control, minority and women's rights movements, direct brain stimulation by implanted electrodes, use of psychoactive drugs, use of the lie detector, and the application of experimental techniques to human beings. *Prereq.* PSY 4111 or equiv.

PSY 4372 Abnormal Psychology I (3 q.h.)

Introduction to the etiology and dynamics of the abnormal personality. *Prereq.* PSY 4112 or equiv.

PSY 4373 Abnormal Psychology 2 (3 q.h.)

Symptomatology and treatment of the neuroses and psychoses. *Prereq.* 4372 or equiv.

PSY 4374 Abnormal Psychology 3 (3 q.h.)

Psychosomatic, psychopathic, and organic disorders; varieties of psychotherapy. *Prereq.* PSY 4373 or equiv.

PSY 4381 Sensation and Perception I (3 q.h.)

Introduction to the nature of the perceptual world, the nature of object recognition and identification, spatial organization, contextual effects, learning and perception, and the influence of attitudinal, motivational, and personality factors on perception. *Prereq.* PSY 4111 or equiv.

PSY 4390 Industrial Psychology I (3 q.h.)

Psychology as applied to industry, including such topics as selection and placement procedures, employee assessment, individual differences and their evaluation, and the place of psychological tests in industry. *Prereq.* PSY 4111 or PSY 4112 or equiv.

PSY 4391 Industrial Psychology 2 (3 q.h.)

Personnel training and development, motivation and work, attitudes and job satisfaction, engineering psychology, and human factors in accident causation. *Prereq.* PSY 4390 or equiv.

PSY 4392 Industrial Psychology 3 (3 q.h.)

Supervision and leadership, morale, personnel counseling, the psychology of labor-management relations, human relations, and organizational behavior. *Prereq.* PSY 4391.

PSY 4471 Psychological Therapies (3 q.h.)

Techniques used for treating deviant behavior, from classical psychoanalytical therapies through methods of behavior modification. *Prereq.* PSY 4374 or equiv.

PSY 4531 Psychology of Learning 2

(Laboratory) (3 q.h.)

Through direct experience, students may gain proficiency in the laboratory analysis of behavior and in evaluating common generalizations about human behavior. Students may design and perform experiments in animal and human learning, memory, decision processes, concept formation, and other topics of individual interest. *Prereq.* PSY 4231 or equiv. (Laboratory fee)

PSY 4551 Physiological Psychology 2

(Laboratory) (3 q.h.)

Laboratory experiments based on the evolution of the nervous system, sensory and motor mechanisms, motivation and emotion, sleep, attention, perception, learning, and memory. *Prereq.* PSY 4351 or equiv. (Laboratory fee)

PSY 4572 Personality 2 (Laboratory) (3 q.h.)

Introduction to methods and areas of research in personality. Includes problems of measurement, behavioral and dynamic concepts, and laboratory projects. *Prereq.* PSY 4272 or equiv. (Laboratory fee)

PSY 4581 Sensation and Perception 2

(Laboratory) (3 q.h.)

Laboratory experiments on seeing, hearing, touching, and tasting. Studies may focus on adaptation to the dark, loudness, binaural interaction, brightness constancy, two-point touch thresholds, information processing, and interactions between the senses. *Prereq.* PSY 4381 or equiv. (Laboratory fee)

PSY 4611 Senior Seminar in Psychology

(3 q.h.)

Small groups of students meet to discuss topics of mutual interest in psychology. Each seminar has a different focus, depending upon the student group and the instructor. *Prereq.* Senior status or instructor's permission.

PSY 4811 Directed Study I (3 q.h.)

Opportunity for qualified students to take an upper-class course in their major on an individual basis. Petitions and procedural instructions are available in the Liberal Arts Program office, 617-437-2416. *Prereq.* 87 q.h.

PSY 4812 Directed Study 2 (3 q.h.)

Opportunity to initiate a second individual study as described in PSY 4811. *Prereq.* PSY 4811.

PSY 4813 Field Work in Psychology (6 q.h.)

Refer to page 83 describing field work courses. *To be discussed with department consultant or advisor prior to registration; subject to Program Director's approval.*

PSY 4891 Honors Program I (4 q.h.)

Prereq. Program Director's approval.

PSY 4892 Honors Program 2 (4 q.h.)

Prereq. PSY 4891 and Program Director's approval.

PSY 4893 Honors Program 3 (4 q.h.)

Prereq. PSY 4892 and Program Director's approval.

PUR 4351 Purchasing I (3 q.h.)

Introduction to the function of purchasing in the industrial organization. Includes purchasing responsibilities, objectives, organization, and personnel requirements; purchasing policy and systems; the role of the computer in regulating purchasing planning, transactions, and information retrieval; acquisition of purchased materials, development of sources of supply, and quality assurance; and determination and maintenance of required inventory levels. Also covers control of in-

ventory investment, price determination, cost and price analysis of purchase transactions, make or buy decisions, and the role of standardization and value analysis.

PUR 4352 Purchasing 2 (3 q.h.)

The process of purchase negotiations, budgets, and purchase of capital equipment. Includes purchasing for public and nonprofit institutions, disposition of surplus and obsolete materials, traffic and material handling, forward buying and speculation, ethical considerations in purchasing, purchasing law, contract cancellations, purchasing reports, evaluation of purchasing performance, and control and audit procedures. *Prereq.* PUR 4351.

PUR 4353 Purchasing (Intensive) (6 q.h.)

Same as PUR 4351 and PUR 4352.

PUR 4357 Business Negotiations (3 q.h.)

Buyer-seller communication and exchange. Explores the interactive process for arriving at a satisfactory agreement between buyer and prospective vendor and accepted strategies employed by both parties. Explores economic and technical considerations and the psychological and interpersonal environments of negotiations. *Prereq.* PUR 4351.

PUR 4358 Materials Requirements Planning (3 q.h.)

The MRP system for integrating and organizing purchasing and inventory management functions. System is based on production schedule requirements and variations rather than on historical data and assists the capacity planning process in reaching maximum manufacturing efficiency. MRP provides a rational base for economical procurement planning and control. Concentration is on MRP's unique concepts for managing material supply activity and other critical operating problems.

PUR 4359 Subcontract Management (3 q.h.)

The administration of procurement subcontracts is of major concern to many industrial specialties, including purchasing, sales, engineering, project management, finance, manufacturing, and general management. Course considers all aspects of this function, from development of the work statement through source selection, negotiation, award and postaward administration. Studies selected cases and exercises to increase the student's appreciation of practical aspects of subcontracting policies and procedures. Also covers commercial and government subcontract requirements. *Prereq.* PUR 4352.

PUR 4365 Production Activity Control (3 q.h.)

Principles, approaches, and techniques used to plan, schedule, control, and evaluate the effectiveness of factory production operations. Includes scheduling and control techniques used in various manufacturing environments. Course may be used as preparation for APICS Certification examinations.

PUR 4370 Inventory Management (3 q.h.)

Basic inventory management objectives, from the control of raw materials to finished goods and distribution inventory management. Includes aggregate inventory controls, lot sizing, customer service objectives, and the financial and physical controls necessary for effective inventory management. Course may be used as preparation for APICS Certification examinations.

PUR 4380 Advanced Purchasing Techniques (3 q.h.)

Purchasing for individuals with previous experience in the field. Discusses new techniques, such as "just-in-time" purchasing and computerized purchasing, and managing vendor quality and value analysis techniques. Concentrates on strategies to reduce the cost of purchased materials and the investment in inventories as well as on managing the effectiveness and continuity of sources of supply. *Prereq.* PUR 4352 or equiv.

RAD 4100 Radiologic Technology Orientation I (3 cl., 3 q.h.)

History of X-radiation, radiology department organization, medical terminology, patient care and nursing procedures, and contrast media.

RAD 4101 Radiologic Technology Orientation 2 (3 cl., 3 q.h.)

Study of medical and surgical diseases. *Prereq.* RAD 4100.

RAD 4102 Radiologic Science I (4 cl., 4 q.h.)

Basic concepts of physics, units of measurement, Newton's law of motion, work, energy, atomic theory of matter, electric currents, magnetism, generators, motor production, control of high voltage, and X-ray production. *Prereq.* MTH 4110.

RAD 4103 Radiologic Science 2 (4 cl., 4 q.h.)

Interaction of X-rays and matter; modern X-ray tubes; X-ray circuits; simulator experiments; fluoroscopic systems; and properties of solids, liquids, and gases. Also covers temperature and heat transfer and their application. *Prereq.* RAD 4102.

RAD 4104 Principles of Radiology I (4 cl., 4 q.h.)

Practical, basic radiation protection and the principles of positioning patients for radiographic studies. *Prereq.* RAD 4114.

RAD 4105 Principles of Radiology 2 (4 cl., 4 q.h.)

Principles of precise body positioning for detailed radiographic studies. *Prereq.* RAD 4104.

RAD 4106 Radiologic Photography and Exposure I (4 cl., 4 q.h.)

Basic principles of image formation, electromagnetic spectrum, X-ray tube construction, and factors controlling radiographic quality. *Prereq.* RAD 4103 and MTH 4110 or equiv.

RAD 4107 Radiologic Photography and Exposure 2 (4 cl., 4 q.h.)

Mathematical formulas used in radiography. Includes in-depth study of sensitometry, phototiming principles, tomography, and radiographic film techniques. *Prereq.* RAD 4102 and RAD 4106.

RAD 4108 Radiology Practicum I (3 q.h.)

Application of theoretical principles by performing radiographic procedures under supervision. Assigned homework is part of lesson plans received while at the hospital; lectures are presented at the hospital and at the University. Program requires a minimum of two hours per week.

RAD 4109 Radiology Practicum 2 (3 q.h.)

Continuation of RAD 4108. *Prereq.* RAD 4108.

RAD 4110 Radiology Practicum 3 (3 q.h.)

Continuation of RAD 4109. *Prereq.* RAD 4109.

RAD 4111 Radiology Practicum 4 (3 q.h.)

Continuation of RAD 4110. *Prereq.* RAD 4110.

RAD 4112 Gross Anatomy and Physiology I (3 cl., 2 lab., 4 q.h.)

Fundamental concepts of living organisms, chemical and biological characteristics of cellular metabolism, and the skeletal system and its appendages. Includes general nomenclature and anatomical names and terms. *The required laboratory is RAD 4113, Lab for RAD 4112, which must be taken at the same time as the course.*

RAD 4114 Gross Anatomy and Physiology 2 (3 cl., 2 lab., 4 q.h.)

Systems of the body, the relationships among them, and the structure and function of each. *The required laboratory is RAD 4115, Lab for RAD 4114, which must be taken at the same time as the course. Prereq.* RAD 4112 or equiv.

RAD 4300 Advanced Radiologic Technology I (3 cl., 3 q.h.)

Special procedures, including cardiovascular procedures, neuroradiology, lymphangiography, and others. *Prereq.* RAD 4103, RAD 4105, and RAD 4107.

RAD 4301 Advanced Radiologic Technology 2 (3 cl., 3 q.h.)

Continued study of special procedures. Offered in the late afternoon. *Prereq.* RAD 4300.

RAD 4302 Imaging Modalities (3 q.h.)

Imaging modalities other than diagnostic X-rays, including xerography, thermography, nuclear medicine, radiation therapy, computerized axial tomography, nuclear magnetic resonance, and ultra sound. Offered in the late afternoon. *Prereq.* RAD 4102, RAD 4105, RAD 4107, and RAD 4114.

RAD 4303 Radiation Protection—Radiobiology (3 q.h.)

Atomic structure, properties of radioactive materials, units of radiation, long-term and short-term biological

effects, survey instruments, reduction of exposure to patients, federal X-ray standards, and radiopharmaceuticals. Offered in the late afternoon. *Prereq.* RAD 4107.

RAD 4304 Cross-Sectional Anatomy

(3 cl., 4 q.h.)

Regional approach to anatomy. Reviews standard anatomy, with emphasis on relations of organs and structures to transverse and longitudinal section appearance. *Prereq.* RAD 4114 or equiv.

RE 4301 Real Estate Fundamentals I (3 q.h.)

Introduction to the basic principles and terminology of real estate useful in various real estate business practices.

RE 4302 Real Estate Fundamentals 2 (3 q.h.)

Practices of real estate brokerage, including real estate appraisal, finance, development, management, and investment. Upon successful completion of RE 4301 and RE 4302, students may take the Massachusetts salesperson's examination. *Prereq.* RE 4301.

RE 4303 Real Estate Fundamentals (Intensive) (6 q.h.)

Same as RE 4301 and RE 4302.

RE 4323 Real Estate Appraisal I (3 q.h.)

Fundamental course in the appraisal of single-family residences. Examines city or town neighborhood influences, site evaluation, building diagnosis, depreciation, the various approaches to value, and appraisal report preparation. *Prereq.* RE 4302.

RE 4324 Real Estate Appraisal 2 (3 q.h.)

Specialized course in the appraisal of income properties. Application of the cost, market, and income approaches to apartment buildings and other commercial and industrial properties and of the various methods of capitalization and residual techniques. *Prereq.* RE 4323.

RE 4326 Appraising a Single-Family Dwelling (3 q.h.)

Fundamental course in appraising a single-family dwelling for the beginning appraiser, real estate broker, salesperson, lender, assessor, or builder. Includes city and neighborhood analysis, site evaluation, building materials and cost, and depreciation. Also includes selected research into appropriate market data, assembling pertinent information, applying relevant analytical techniques, and preparing appraisal reports, including FNMA/FMAC report forms.

RE 4328 Real Estate Financial Analysis I

(3 q.h.)

How to critically examine and analyze any proposed real estate investment. Explores in detail the financial aspects of acquisition, ownership, and disposition, and considers taxation of investments, forms of property ownership (organization of the venture), analysis of operating statements, financial accounting, use of lever-

age, "tax-sheltered" investments, and special situations. Develops criteria of risk and return on investment (ROI) that should be established by various types of investors. *Prereq.* RE 4324 or instructor's permission.

RE 4329 Real Estate Financial Analysis 2

(3 q.h.)

Detailed analysis of the risks and rewards of real estate investments and problems involved in financing income properties, using case studies, homework problems, and class discussion and debate. Stresses class participation. *Prereq.* RE 4328.

RE 4330 Real Estate Financial Analysis (Intensive) (6 q.h.)

Same as RE 4328 and RE 4329. *Prereq.* RE 4324.

RE 4340 Real Estate Development (3 q.h.)

Practical, step-by-step approach to the organization and development of a real estate project for the entrepreneur, banker, or broker. Includes the role of the developer, acquisition of land, site analysis, construction finance, gap financing and permanent commitments, project budgeting for capital costs and for income and expense, selection of professionals, negotiations of agreements with contractors and owners, and marketing the completed project. Case studies and guest lecturers may be used. *Prereq.* RE 4329 or instructor's permission.

RE 4341 Real Estate Law I (3 q.h.)

Private real estate law, including ownership rights in land, leasehold rights, and easements in the land of another; legal forms of ownership; the transfer and acquisition of title and of other interests; recording of deeds, leases, and other instruments; and the landlord-tenant relationship.

RE 4342 Real Estate Law 2 (3 q.h.)

Public real estate law, including government powers, rights, and controls on privately owned real estate; zoning and subdivision controls; conservation controls; taxation of real estate; rent controls; and eminent domain. *Prereq.* RE 4341.

RE 4344 Real Estate Management I (3 q.h.)

Prepares students for the practical problems of real estate management. Stresses the requisite day-to-day management of commercial, industrial, and residential properties as well as the need for a management strategy relating to long-term property values. *Prereq.* RE 4302 or instructor's permission.

RE 4345 Real Estate Management 2 (3 q.h.)

Continuation of RE 4344. *Prereq.* RE 4344.

RE 4346 Real Estate Management 3 (3 q.h.)

Continuation of RE 4345. *Prereq.* RE 4345.

RE 4347 Real Estate Title Examination (3 q.h.)

Specialized course dealing with the examination of real estate titles and the preparation of a complete report. *Prereq.* RE 4341 or instructor's permission.

REC 4101 Principles and Practices of Therapeutic Recreation 1 (3 q.h.)

Overview of the field, including rationale, history, philosophy, goals, treatment settings, problems of institutionalization, adjunctive therapies, and professional development.

REC 4102 Principles and Practices of Therapeutic Recreation 2 (3 q.h.)

Basic medical terminology with an overview of traumatic, sensory, neurological, orthopedic, and cardiovascular disabilities. Also includes prosthetics, orthotics, and an examination of attitudinal and societal barriers for the handicapped. *Prereq.* REC 4101 *or consultant's permission.*

REC 4103 Principles and Practices of Therapeutic Recreation 3 (3 q.h.)

Integrated case-method approach to understanding the diversified needs of the person who has a handicap. Looks at the psychological, sociological, and emotional impact of disabilities as well as how to design, chart, and evaluate individual and group activities. *Prereq.* REC 4102.

REC 4110 Group Dynamics and Leadership I (3 q.h.)

Self-awareness, identity, and interpersonal and intergroup communications. Includes process factors influencing the need to join the group; motivation to participate; membership screening; size and purpose of the group; open-ended and closed approaches; group problem solving; brainstorming; and conflict resolution.

REC 4111 Group Dynamics and Leadership 2 (3 q.h.)

Organization, development, and structure of groups; team building; role and value clarification; ramifications of change; group characteristics; and leadership styles and techniques. *Prereq.* REC 4110.

REC 4112 Group Dynamics and Leadership (Intensive) (6 q.h.)

Same as REC 4110 and REC 4111.

REC 4300 Arts and Crafts I (3 q.h.)

Overview of the creative media available for individual projects. Includes how to develop the technical capability to use a wide variety of materials in imaginative ways and the compilation of a personal arts and crafts manual as a reference tool.

REC 4301 Arts and Crafts 2 (3 q.h.)

Adapting creative skills to a therapeutic setting. Emphasizes continued development of technical capabilities and of instructional skills (one-to-one and group). Also discusses the planning, implementation, and integration of craft programs.

REC 4302 Arts and Crafts (Intensive) (6 q.h.)

Same as REC 4300 and REC 4301.

REC 4310 Social Recreation (3 q.h.)

Planning, organization, and motivation for social recreation activities, including ice breakers, mixers, active and inactive games, joint projects, and special events geared to a variety of settings.

REC 4311 Music Therapy (3 q.h.)

Introduction to the field of music therapy, including an exploration of historical and current theories and various techniques used in clinical settings. Also includes a survey of the literature of therapy, covering special education and psychiatric and geriatric areas.

REC 4312 Media Resources and Techniques (3 q.h.)

How to design overlays, transparencies, posters, brochures, and other materials and creatively use slides and tapes. Also covers the operation of P.A. systems, 16 mm. opaque film strips, overhead projectors, and other photographic devices.

REC 4313 Therapeutic Use of Dramatics (3 q.h.)

The value of reinforcement and socialization through pantomime, improvisations, puppetry, skits and stunts, dramatic games, storytelling, and one-act plays. Emphasizes creativity in the therapeutic setting.

REC 4401 The Nursing Home Experience (3 q.h.)

Exchange of empirical data relating to case experiences and institutional procedures encountered by activity leaders and other practitioners in nursing homes. Examines the feasibility of functional innovations in relation to present practices.

REC 4410 Therapeutic Recreation in Rehabilitation (3 q.h.)

Philosophy, goals, and background in rehabilitation; team membership concepts. Includes the role of therapeutic recreation in the acute and chronic hospital, the rehabilitation center, and in various community settings.

REC 4420 Activity and Movement Analysis (3 q.h.)

Basic anatomy as it relates to the identification of muscle groups in action. Analyzes both the movement and the ingredients of the activity and their suitability with given disabilities. *Prereq.* BIO 4175.

REC 4425 Mental Illness and Retardation (3 q.h.)

Origins and manifestations of mental illness and retardation. Historical and contemporary overviews include discussions of treatment, settings, case studies, and trends.

REC 4430 Therapeutic Recreation in Child Development (3 q.h.)

Growth and development patterns from birth to age 12. Includes study of the need for play, learning through play, and the therapeutic value of play. Exa-

mines biological, psychological, and sociological aspects by watching children at play.

REC 4440 Humanistic and Holistic Approaches in Therapeutic Recreation (3 q.h.)

Use of trust, imagination, verbal and nonverbal communication, intuition, emotions, the will, spirit, motor coordination, sensory awareness, and self-responsibility to develop innovative programming.

REC 4445 Community Recreation for the Handicapped (3 q.h.)

Developing and initiating a comprehensive special needs program in the community by integrating efforts with school and special education departments, municipal officials, and parent groups. Covers needs statements, concepts of budgeting and funding, publicity, and program development. Site visits.

REC 4460 The Process of Aging (3 q.h.)

Psycho-social dynamics of growing old, physical changes as a result of aging, the needs of people as they age, and attitudes toward work, retirement, and leisure. A study of dependency versus independence, remotivation, death and dying, and programs and services that add quality to the long life.

REC 4461 Camping for the Disabled (3 q.h.)

Basic goals, values, and procedures for operating outdoor education and camping programs. Emphasizes social integration with nondisabled children and the development of innovative programs.

REC 4462 Leisure Counseling (3 q.h.)

Remedial and developmental process designed to produce behavior and attitude changes in the client's leisure patterns. Development of competence in identifying, using, and referral to appropriate recreational resources. Compares leisure counseling fundamentals in a variety of recreational settings.

REC 4500 Field Practicum I (4 q.h.)

Assigned field experience in a treatment facility under supervision of a qualified professional. Students have the opportunity to learn about the direct service application of classroom theory through observation and participation and written reports, evaluations, and seminars. The experience averages eight hours a week for 12 weeks. *Prereq.* REC 4103 plus 12 q.h. of professional courses and practicum coordinator's permission.

REC 4501 Field Practicum 2 (4 q.h.)

Continuation of REC 4500. *Prereq.* REC 4500.

REC 4802 Independent Study I (4 q.h.)

Research study, through survey and other methods, geared to the individual's area of professional focus. Students are expected to gather, analyze, and evaluate data and periodically submit progress reports to the research advisor. *Prereq.* REC 4103 and consultant's permission.

REC 4803 Independent Study 2 (4 q.h.)

Continuation of REC 4802. *Prereq.* REC 4802.

SOA 4100 Physical Anthropology (formerly Anthropology 1) (3 q.h.)

Introduction to elements of physical anthropology, covering such subjects as primates, fossil humans and evolution, problems of heredity and genetics, race and racial classifications, and the bases of cultural behavior. *Not open to students who have credit for SOC 4010.*

SOA 4101 Cultural Anthropology: Preliterate Societies (formerly Anthropology 2) (3 q.h.)

Introduction to socio-cultural anthropology. Examines the nature of language and the cultural institutions of human groups with simple foraging and horticultural adaptation. *Not open to students who have credit for SOC 4011.*

SOA 4102 Cultural Anthropology: Industrial Societies (formerly Anthropology 3) (3 q.h.)

The institutions and cultures of technologically advanced societies and states.

SOA 4103 Anthropology Intensive A (6 q.h.)

Same as SOA 4100 and SOA 4101.

SOA 4104 Anthropology Intensive B

(formerly Anthropology Intensive) (9 q.h.)

Same as SOA 4100, SOA 4101, and SOA 4102.

SOA 4146 Peasant Societies in a Changing World (3 q.h.)

Changes affecting traditional peasant cultures in the non-Western and Western worlds. Examines the processes occurring in situations involving culture contact, conquest, and colonialism.

SOA 4155 Individual and Culture (3 q.h.)

Cross-cultural comparisons of the socialization and acculturation of children and adults with respect to roles, values, and personality. Examines theories and methods used in psychological anthropology.

SOA 4160 Sex, Sex Roles, and the Family (3 q.h.)

Analysis of popular and scientific notions about sex and the family by examining the social patterning of interactions in our culture, other cultures, and other species. Emphasizes the changing relationships between men and women.

SOA 4266 Folklore (3 q.h.)

Folklore, art, and song in various societies and how they are studied. Examines contemporary American materials.

SOA 4322 Anthropological Theory (3 q.h.)

History of the major orientations and philosophies of anthropology, including evolutionist, culture area, and historical approaches and functional, structural, ecological, and cognitive modes of analysis.

SOA 4430 Native North American Peoples (3 q.h.)

Past and present circumstances of a number of native North American peoples.

SOA 4431 African Peoples and Cultures

(3 q.h.)

African geography, prehistory, and culture; the spectrum of societal complexity ranging from Mbuti egalitarianism to Ashanti federation; and the problems of political, economic, and social change in contemporary Africa.

SOA 4434 Latin American Peoples and Cultures (3 q.h.)

Tribal and peasant adaptations of native and Hispanic populations to changing conditions in Latin America.

SOA 4470 Religion in Cross-Cultural Perspective (3 q.h.)

Comparative analysis of the rituals, beliefs, and religious institutions of various groups.

SOC 4010 Principles of Sociology I (4 q.h.)

Introduction to basic concepts and theories relating to the study of people as participants in group life. Emphasizes socialization, culture, social structure, primary groups, family, social stratification, and population. *For Alternative Freshmen only. Not open to students who have credit for SOC 4100 or SOC 4101.*

SOC 4011 Principles of Sociology 2 (4 q.h.)

Continuation of SOC 4010, emphasizing critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. *For Alternative Freshmen only. Not open to students who have credit for SOC 4101 or SOC 4102. Prereq. SOC 4010 or equiv.*

SOC 4100 Fundamental Issues in Sociology (formerly Introduction to Sociology: Fundamental Issues) (3 q.h.)

Basic theoretical perspectives, research methods, and concepts of sociology, including society, status and role, socialization, and social groups. *Not open to students who have credit for SOC 4010.*

SOC 4101 The Individual and Social Roles

(formerly Introduction to Sociology: The Individual and Social Roles) (3 q.h.)

Involvement of individuals in society, including culture, social interaction, deviance, sex roles, sexuality, and family. *Not open to students who have credit for SOC 4010 or SOC 4011. Prereq. SOC 4100 or equiv.*

SOC 4102 Critical Issues Facing Society

(formerly Introduction to Sociology: Critical Issues Facing Society) (3 q.h.)

Social factors of importance, including business and industry, population and ecology, science and technology, class, and race and ethnic relations. *Not open to students who have credit for SOC 4011. Prereq. SOC 4100 or equiv.*

SOC 4103 Introduction to Sociology

Intensive A (formerly Sociology Intensive) (9 q.h.)

Same as SOC 4100, SOC 4101, and SOC 4102.

SOC 4104 Introduction to Sociology

Intensive B (6 q.h.)

Same as SOC 4100 and SOC 4101.

SOC 4120 Sociology of Boston (3 q.h.)

The City of Boston from the perspectives of environmental development, neighborhood and intergroup relations, institutional services, and symbolic meanings. The city is a laboratory for exploring the people's search for a lifestyle and the satisfaction of their needs. Includes field trips with workbook and requires use of documentary and literary sources for term paper report. *Does not meet elective requirements for Sociology-Anthropology major.*

SOC 4125 Social Problems (3 q.h.)

Contemporary American social problems and the application of sociological concepts, methods, and principles to these problems.

SOC 4147 Urban Sociology (3 q.h.)

Various causes, characteristics, and effects of urbanization in several different cultures. Gives specific attention to the problem of urban and suburban living and the changing structure of the city.

SOC 4154 Sex and Gender Roles in Society

(formerly Sex in Society: The Study of Sex Roles) (3 q.h.)

Historical and contemporary developments, examining the ways in which men's and women's changing roles are related to society at large.

SOC 4155 Sociology of the Family (formerly Sociology of the Family 1) (3 q.h.)

The family as a social institution in several selected cultures; family interrelations with political, economic, and educational institutions; and the changing nature of the family.

SOC 4156 Violence in the Family (formerly Sociology of the Family 2) (3 q.h.)

Physical, emotional, and sexual violence that occurs in families, emphasizing child and spouse abuse. Analyzes definitions, prevalence, causes, prevention, and treatment of specific cases of violence. Primary focus is on social and policy issues and problems of legal intervention.

SOC 4170 Race and Ethnic Relations (3 q.h.)

Relationships among various racial, national, cultural, and religious groups, emphasizing the development of black-white relationships in American society. Also covers the problems of contemporary minority peoples in American and other societies.

SOC 4175 Sociology of Work (3 q.h.)

The world of work, focusing on the development of occupational cultures, the nature of careers, and the meanings and implications of professionalization. Students are encouraged to do a project on a career they are considering or one in which they have had practical experience on co-op.

SOC 4176 Business and Industrial Sociology (3 q.h.)

Role of industry in modern society. Examines similarities and dissimilarities among industrial societies, bureaucracy and its alternatives, unions, supervision democracy and manipulation, the individual on the assembly line, sabotage of the organization, and the role of wages and alienation.

SOC 4185 Sociology of Deviant Behavior (3 q.h.)

A variety of social problems and their relation to the organization of society. Pays particular attention to alcoholism, sexual offenses, drug abuse, mental disorders, and other responses to conditions of urban industrial society.

SOC 4186 Social Control (3 q.h.)

Group membership as a determinant of behavior, including analysis of status and role, patterns of authority, power, and group ideology as factors in the evaluation of conduct.

SOC 4190 Juvenile Delinquency (3 q.h.)

Factors involved in juvenile delinquency and their implications for prevention, rehabilitation, and treatment.

SOC 4195 Drugs and Society (3 q.h.)

Introduction to the sociology of drugs. Examines social definitions of drugs, conditions of their use, and socialization into drug use. Considers deviant drug use and effects of social control on definitions and use. A range of licit and illicit drugs is considered.

SOC 4205 Law and Society (3 q.h.)

Functions of law in modern society; legislation, litigation, and adjudication as social processes; the legal profession, the courts, and the administration of justice; laws and judicial decisions on controversial social issues; and laws regulating domestic, industrial, and other major social relationships.

SOC 4215 Medical Sociology (3 q.h.)

Sociological concepts and research relating to patterns of behavior in the areas of health and disease. Emphasizes the family, community, medical organizations, class, and status as social subsystems related to the field of health.

SOC 4220 Sociology of Mental Health (3 q.h.)

Sociological aspects of mental health and mental disorder. Examines the social history of mental illness, epidemiological and cross-cultural approaches to mental disorder, the career of the mental patient, the functions of psychiatry in society, community and social treatment modalities, and social psychiatry.

SOC 4225 Social Gerontology (3 q.h.)

Issues and questions of aging, with special attention to social and economic consequences of the aging process, such as retirement and productivity, health care problems, nursing home residences, widower- and widowhood, and the approach of death. Presents examples relating to aging in other cultures in a search

for new answers to social problems of aging in the United States. Discusses how to anticipate, cope with, and even prevent problems of aging that concern self, family, and clients or patients.

SOC 4226 Work, Leisure, and Aging (3 q.h.)

Theory and practice of leisure time activities as they relate to the older adult. Examines the social, cultural, and economic aspects of work, including housework, and the meaning of leisure. Explores various types of leisure activities and resources as well as how to build skills and design and implement activities.

SOC 4240 Sociology of Human Service Organizations (3 q.h.)

The contradiction between what human service organizations set out to do and what they actually accomplish. Includes how human service organization goals are defined, how clients become labeled, and the societal constraints placed on clients, workers, and the organizations.

SOC 4241 Human Services Professions (3 q.h.)

Human services, viewed from the perspectives of the recipient, the worker, and the society at large. Includes analysis of why they are needed, how agencies and programs have developed, and the basic skills, attitudes, values, and knowledge required of the human service worker today.

SOC 4245 Poverty and Inequality

(formerly Sociology of Inequality) (3 q.h.)

Historical analysis of American class and ethnic differences, drawing on comparisons with other countries. Includes critical evaluation of sociological research and theories relating to the causes and effects of poverty and societal responses to it. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, pre-med, and pre-law.

SOC 4255 Sociology of Sport (3 q.h.)

Games and sport from a sociological perspective, with particular reference to contemporary American society. Includes such topics as the role of play in modern society, the social organization of specific games and sports, and the relation of organized sport to the larger society.

SOC 4260 Introduction to Social Work Practice I (3 q.h.)

Functions of the helping profession of social work, its settings and methods. Covers specific techniques, such as interviewing, history taking, and recording skills.

SOC 4261 Introduction to Social Work Practice 2 (3 q.h.)

Continuation of SOC 4260, with particular attention to the functioning of social workers in selected settings. *Prereq.* SOC 4260 or equiv.

SOC 4262 Introduction to Social Work Practice 3 (3 q.h.)

Continuation of SOC 4261, emphasizing enhancement of practice skills. *Prereq.* SOC 4261 or equiv.

SOC 4276 Sociology of Popular Culture

(3 q.h.)

Significance of expressions of popular culture, such as film, television, music, and literature. Examines media production, organization, technology, and audience consumption. Also explores the relationship between popular culture and existing socio-economic institutions.

SOC 4300 Social Theory I (3 q.h.)

Historical survey of sociological theorists, including the work of de Tocqueville, Comte, Marx, Durkheim, and Cooley. *Prereq.* Instructor's permission or 12 q.h. in *Sociology-Anthropology*.

SOC 4301 Social Theory 2 (3 q.h.)

Major theoretical issues in sociology. Discussion concentrates on systematic questions and topics rather than on particular theorists, but material is drawn from such theorists as Weber, Simmel, Thomas, Mannheim, Merton, and Parsons. *Prereq.* SOC 4300 or equiv.

SOC 4302 Social Theory 3 (3 q.h.)

Seminar focusing on questions of theoretical interest, such as the problem of order, the problem of change, and the role of the individual in change. Students present papers in class. *Prereq.* SOC 4301 or equiv.

SOC 4303 Social Theory (Intensive) (9 q.h.)

Same as SOC 4300, SOC 4301, and SOC 4302. *Prereq.* Instructor's permission or 12 q.h. in *Sociology-Anthropology*. Not open to students who have credit for SOC 4300, SOC 4301, or SOC 4302.

SOC 4310 Class, Power, and Social Change (3 q.h.)

Theories of social equality and inequality as applied to the exercise of power and to the growth and development of social movements and group conflict. Takes a large-scale, social-change point of view.

SOC 4321 Social Research Methods I: Generating and Investigating Research Problems (4 q.h.)

Methods for gaining knowledge through social research. Emphasizes the practical aspects of research, such as the problems sociologists face in doing research and how they have been solved. Students are required to design a small study.

SOC 4322 Social Research Methods 2:

Tabulating and Analyzing Social Data (4 q.h.) Methods of tabulating, presenting, summarizing, and analyzing data, including elementary descriptive and inferential statistics and how to use them. Emphasizes statistics as a tool and introduces the use of the computer. *Prereq.* SOC 4321 or equiv.

SOC 4323 Social Research Methods 3: Doing Social Research (4 q.h.)

Students carry out the study they designed in SOC 4322, analyze data, and report results. Includes the ethics and politics of social research and the interrela-

tionship of social action, social research, and theory building. *Prereq.* SOC 4322 or equiv.

SOC 4348 Seminar in Urban Studies (3 q.h.)

Interdisciplinary approaches to analyses of urban issues. Continuing student projects. *Prereq.* One course in an urban studies field.

SOC 4375 Sociology of Occupations and Professions (3 q.h.)

Social relations within occupational groups; occupational structures; and the institutional aspects of an occupation. Also discusses relationships among supervisors, peers, colleagues, subordinates, and clientele and their significance for work-role behavior.

SOC 4376 Sociology of Industry (3 q.h.)

Comparison of pre-industrial and industrial society, stressing the impact of industry on society and the interrelationship of industry, culture, and values. Also discusses diversification, specialization, human relations, and formal and informal groups.

SOC 4800 Directed Study I (3 q.h.)

Opportunity for qualified students to take an upper-level course in their major on an individual basis. Petitions and procedural instructions are available in the Liberal Arts Program office, 617-437-2416.

SOC 4801 Directed Study 2 (3 q.h.)

Second opportunity to initiate individual study as described in SOC 4800. *Prereq.* SOC 4800.

SOC 4805 Field Work in Sociology (6 q.h.)

Refer to page 83 describing field-work courses. To be arranged with a department field-work advisor prior to registration. Students who are eligible for department honors courses may take any combination of field work and honors totaling three courses, subject to the Program Director's approval. *Prereq.* Major in *Sociology-Anthropology* and completion of 15 credits in *Sociology*. Students may receive credit for only one departmental field-work course.

SOC 4820 Honors Program I (4 q.h.)

Independent work in a selected area under the direction of members of the department. Students may take any combination of field work and honors totaling three courses. *Prereq.* SOC 4302, SOC 4323, and Program Director's approval.

SOC 4821 Honors Program 2 (4 q.h.)

Second opportunity to do independent work as described in SOC 4820. *Prereq.* SOC 4820 and Program Director's approval.

SOC 4822 Honors Program 3 (4 q.h.)

Additional opportunity to do independent work as described in SOC 4820. *Prereq.* SOC 4821 and Program Director's approval.

SPC 4001 Speaking Skills for International Students I (3 q.h.)

Introductory instruction in pronunciation and intelligibility for formal and informal situations. Monitors

communication skills through use of video and audiotape recordings and work in the language laboratory. Following diagnostic testing, students participate in individualized small- and large-group instructional situations. Placement tests are given during the first week of class.

SPC 4002 Speaking Skills for International Students 2 (3 q.h.)

Intermediate-level course designed for persons who have previously studied English, but who need to develop oral communication proficiency. Monitors communication skills through use of video and audiotape recordings and work in the language laboratory. Following diagnostic testing, students participate in individualized small- and large-group instructional situations. Placement tests are given during the first week of class.

SPC 4003 Speaking Skills for International Students 3 (3 q.h.)

Advanced-level course designed for students who have previously studied English and who can make themselves understood easily, but who have difficulty conversing. Includes task-oriented interaction, a variety of two-person communication situations, and small-group interactions. Progress is monitored through use of video and audiotape recordings. Placement tests are given during the first week of class.

SPC 4101 Fundamentals of Human Communication (formerly Effective Communication 1) (3 q.h.)

Students explore group dynamics and apply their knowledge to the classroom experience while developing skills in group decision making, problem solving, membership functions, and leadership styles.

SPC 4102 Group Discussion (formerly Effective Communication 2) (3 q.h.)

Focuses on small-group communication, elements of group structure, task and maintenance functions, leadership, and formalized methods of group problem solving and decision making. *Prereq.* SPC 4101 or equiv.

SPC 4104 Effective Communication (Intensive) (6 q.h.)

Same as SPC 4101 and SPC 4102.

SPC 4111 Voice and Articulation (3 q.h.)

Developing the speaking voice, with emphasis on articulation, pitch control, and vocal variety and flexibility. Includes basic theory of the vocal mechanism.

SPC 4150 Self-Concept and Communication (3 q.h.)

The ways communication patterns are formed and how they work in our personal and professional lives. Emphasizes how self-concept affects communication. By combining thinking, feeling, and doing, students can develop awareness of their attitudes and habits and explore alternative communication patterns.

SPC 4151 Listening (3 q.h.)

Students identify their unique listening styles and explore ways to make them more flexible. Covers reasons for poor listening, techniques for effective listening, and giving and receiving feedback.

SPC 4152 Interviewing (3 q.h.)

Fundamental communication principles and how they apply to the interview process. Examines these principles from the perspectives of the interviewer and the interviewee, helping students to prepare for both roles. Gives special attention to employment, information retrieval, and persuasive interviews.

SPC 4153 Techniques of Persuasion (3 q.h.)

Communication strategies used when attempting to influence others. Examines instances of persuasion as they occur in advertising, politics, social interaction, sales, and business.

SPC 4154 Negotiation Skills (3 q.h.)

Skills involved in bringing matters to mutually acceptable settlements. Through lectures, discussions, case studies, and classroom activities, students examine conflict resolution in both personal and professional settings.

SPC 4201 Argumentation and Discussion

(3 q.h.)

Basic concepts of argumentation, such as evidence, research, and refutation, with emphasis on the psychology of the audience and various types of group discussion.

SPC 4221 Interpersonal Communications I

(3 q.h.)

Ways of becoming more aware of one's self and one's relationship to others. Explores options for communicating and for increasing one's knowledge of the group process. Limited enrollment.

SPC 4222 Interpersonal Communications 2

(3 q.h.)

Continuation of SPC 4221. *Prereq.* SPC 4221 or instructor's permission.

SPC 4231 Female/Male Communication I

(3 q.h.)

Ways in which female/male relations are created, maintained, developed, or dissolved through communication. Examines the influence of family, friends, the media, and "significant others" in sustaining stereotypes for both sexes and the impact of such stereotyping on the self and on effective communication. Also looks at the use of verbal and nonverbal communication to understand the types of relationships between men and women and how different female/male language styles affect these relations.

SPC 4232 Female/Male Communication 2

(3 q.h.)

Interaction and transactional approaches to analyzing existing relationships. Provides the opportunity to develop skills in diagnosing communication transactions and in developing strategies for effective communication. The influence of supportive and defensive environments and the communication behavior of each are examined and applied to strategies for improving relationships between males and females. *Prereq.* SPC 4231 or instructor's permission.

SPC 4251 Business and Professional Speaking

(3 q.h.)

Practice in the organization and presentation of material to fit varying audiences. Emphasizes delivery techniques and effective presentation of ideas.

TCC 4050 Wordstar (2 q.h.)

Composing and writing on a computer screen using Wordstar, the professional text-editing system used by many professional technical writers and editors. Course provides interpretation of the instruction manual as well as hands-on experience with University-supplied personal computers and software.

TCC 4101 Technical Writing I (3 q.h.)

Introduction to basic technical writing skills, emphasizing selecting and organizing data. Includes audience analysis, research techniques, and descriptions of objects, mechanisms, and processes. Provides practice in descriptive writing, classification and definition, paragraphing, and preparing technical documentation outlines. Includes frequent technical writing exercises and projects applicable to both software and hardware writing tasks. A writing proficiency test is given at the first class meeting.

TCC 4102 Technical Writing 2 (3 q.h.)

Application of the information gathering, organizational, and technical writing skills acquired in TCC 4101 to more advanced projects. Extensive practice in formatting, organizing, writing, and editing technical reports. *Prereq.* TCC 4101.

TCC 4103 Technical Writing (Intensive)

(6 q.h.)

Same as TCC 4101 and TCC 4102. A writing proficiency test is given at the first class meeting.

TCC 4105 Editing for Science and Technology (3 q.h.)

Fundamentals of editing as they apply to scientific, technical, and engineering writing. The role of the editor in business, industry, and the sciences; basic editorial services such as proofreading, copy and content editing, production editing, and project editing; analysis and critique of manuscripts; work with authors; the editor as writer and interviewer; and science interpretation and technical translation. Accelerated work for students already skilled in spelling and grammar. *Prereq.* TCC 4101 or instructor's permission.

TCC 4110 Technical-Promotional Writing

(3 q.h.)

Structure, style, and graphic presentation of technical-promotional writing in a high-tech environment. Students are trained to combine technical knowledge and writing skills in developing quality technical brochures, articles, product catalogs, demonstration kits, slide presentations, and video scripts. *Prereq.* TCC 4101, TCC 4102, or instructor's permission.

TCC 4301 Computer Software Technical Writing I (3 q.h.)

Introduces the tasks and problems unique to software technical writing. Includes review of fundamental software concepts, the role and importance of software documentation, component parts of software technical manuals and their purposes, tutorial and reference functions of manuals, research tools for manual writing, and the writing process itself. *Prereq.* TCC 4101 and MIS 4102 or instructor's permission.

TCC 4302 Computer Software Technical Writing 2 (3 q.h.)

Continuation of TCC 4301. *Prereq.* TCC 4301.

TCC 4311 Instruction Manual Writing I

(formerly Hardware Technical Manual Writing I)

(3 q.h.)

Introduces the fundamentals of technical manual writing, including the theory and practice of manual design, organization, and content. Covers copyright law, product liability, graphic design, readability, manual specifications and standards, illustrations, and reproduction techniques. Emphasizes hardware operations manuals. Includes individual and class design and writing projects. *Prereq.* TCC 4101 and TCC 4102.

TCC 4312 Instruction Manual Writing 2

(formerly Hardware Technical Manual Writing 2)

(3 q.h.)

Application of skills acquired in TCC 4311 to an entry-level technical manual writing project. Students elect individual or group writing and production projects for high-technology equipment or systems lacking adequate documentation. Includes instruction in writing safe, legible, operating instructions and descriptions of installation procedures, principles of operation, and maintenance. Also covers manual changes and updates. *Prereq.* TCC 4311 or instructor's permission.

TCC 4320 Proposal Writing (3 q.h.)

Background in the preparation of proposals, including how to analyze a request for proposal or bid set. Introduces the various types of proposals generated by industry and provides an opportunity to prepare a proposal in a simulated situation, through role playing and participation on a proposal preparation team. Includes considerable analysis and writing practice. *Prereq.* TCC 4102 or instructor's permission.

TCC 4330 The Business and Technical Presentation (3 q.h.)

Application of the principles of technical communication to audiovisual presentations. Includes audience analysis, techniques of organization, script preparation, media selection, the design and production of visuals, the influence of physical factors on communication, and the elements of effective delivery. Participants prepare and deliver presentations and receive video playback and peer critiques.

TCC 4350* Concepts of Modern Technology I (3 q.h.)

Applications of physical science to mechanical devices, including an introduction to the laws of thermodynamics and the influence of material properties on design and manufacturing techniques. *Prereq.* MTH 4082*.

TCC 4351* Concepts of Modern Technology 2 (3 q.h.)

Applications of physical science to electrical and electronic devices, including an introduction to electronic circuit design, a comparison of various devices used for amplification and control, and a study of the development of the electronic digital computer and the components involved in the manufacture of computers. *Prereq.* TCC 4350*.

TCC 4353* Modern Electronics (3 q.h.)

Components available to the designer of electronic devices, including linear integrated circuits and digital building blocks. Topics include operational amplifier characteristics, truth tables and the synthesis of digital logic, logic families and specifications, counters, registers and decoding, digital instruments, and digital-to-analog conversion.

TCC 4800 Directed Study I (3 q.h.)

Opportunity for qualified students to take an upper-level, required course when the needed course is not available at the time recommended in the degree sequence. Petitions and procedural instructions are available from the Liberal Arts Program office, 617-437-2416. Allow at least six weeks to complete the petition process. *Prereq.* 87 q.h.

TCC 4801 Directed Study 2 (3 q.h.)

Opportunity to initiate a second individual study as described in TCC 4800. *Prereq.* TCC 4800.

TRN 4301 Elements of Transportation (3 q.h.)

Introduction to regulatory, economic, and management aspects of transportation from the viewpoints of the shipping industry, government, and carrier management. Includes cost, rates, operations, entry, mergers, and intercity passenger carriage. Course is of general interest to students in business, law, or government.

TRN 4302 Physical Distribution Management (3 q.h.)

Introduction to the physical distribution management concept. Includes inventory control, warehousing, cost control, and locational strategy. Course uses text and case materials developed from industry situations.

TRN 4305 Traffic Management I—Rates and Tariffs (3 q.h.)

Practical course in the interpretation and use of tariffs. Includes classification, rate scales, tariff rules, rate-making procedures, and ICC law and practice.

TRN 4306 Traffic Management 2—Selected Topics (3 q.h.)

Further study of traffic management, covering such topics as routing, claims, insurance, consolidation, and packaging. *Prereq.* TRN 4305.

TRN 4307 Contemporary Issues in Transportation and Distribution (3 q.h.)

Examination of a number of topics of particular interest during the current academic year.

TRN 4316 Carrier Management (3 q.h.)

The transportation system from the carrier viewpoint. Includes managerial response to a heavily regulated and rapidly expanding environment and carrier decision making involving routes, scheduling, financing, and pricing of services.

TRN 4321 Transportation Regulation I (3 q.h.)

Principal elements of transport regulation, public policy, and the role of federal and state regulatory agencies. Special attention is given to the types of commerce, carriers, and services subject to regulation; entry and exit requirements; economic and cost considerations; and selective rate and tariff construction rules. Addresses all modes of transportation, emphasizing rail and motor issues.

TRN 4322 Transportation Regulation 2 (3 q.h.)

Regulations and industry practices covering performance requirements, liabilities, and responsibilities of shippers; regulated carriers; and exempt forms of transportation. Reviews rules and procedures established by the ICC and Massachusetts DPU, with special attention to informal and modified procedure cases. *Prereq.* TRN 4321.

TRN 4325 Management of Warehouse Operations (3 q.h.)

Practical course in the management of warehouses. Includes site selection, construction, finance, operations, measurement of performance, and warehouse technology.

TRN 4330 Organization and Control of Physical Distribution Management (3 q.h.)

Establishment of the firm's physical distribution organization, its interrelation with other company functions, and advanced physical distribution problems.

*This is a School of Engineering Technology course, offered at a different tuition rate from that of University College.

**TRN 4331 Surface Transportation I—
Railroad Management** (3 q.h.)

Management-oriented course on the current and future status of railroads. Includes investment and finance, mergers, marketing, labor relations, diversification, and public policy.

**TRN 4332 Surface Transportation 2—
Motor Carrier Management** (3 q.h.)

Management-oriented course on the regulated motor carrier industry. Includes equipment selection, finance, mergers, marketing, labor relations, routes, operations and control, and public policy.

**TRN 4333 Surface Transportation 3—
Marine Transportation** (3 q.h.)

Management-oriented course on the U.S. Merchant Marine. Includes international trade patterns, government promotion and regulation, technological innovations, port facilities, and labor relations.

**TRN 4334 Surface Transportation 4—
Private Trucking** (3 q.h.)

Management-oriented course on the formation of a private trucking operation. Includes legal guidelines, purchase versus lease, operations, and performance measurement.

TRN 4340 Air Transportation (3 q.h.)

Economics and regulation of air carriage certified by the Civil Aeronautics Board. Includes entry, operations, pricing, mergers, cost analysis, and financing.

TRN 4341 Urban Transportation (3 q.h.)

The scope and status of transportation in our metropolitan area. Examines the planning and financing of urban transportation systems, the role of local, state, and federal government units, and the problems of transit management.

**TRN 4342 Transportation Loss, Damage, and
Other Claims** (3 q.h.)

Rules, regulations, and other pertinent elements of transportation claims resulting from the loss or damage of cargo, overcharges and undercharges, and related carrier and shipper activities.

**TRN 4350 International Transportation and
Distribution Management** (3 q.h.)

Role of the United States in international transportation. Emphasizes the industry structure of two primary modes of international transportation—aviation and maritime. Also examines the major, indirect supporting businesses and agencies involved in the international movement of people and goods.

**TRN 4351 Case Studies in Transportation
Regulation I** (3 q.h.)

Intensive study of pertinent areas of transportation regulation and economics. Involves preparation of selected cases dealing with many areas of traffic law to develop an understanding of the Interstate Commerce Act and related statutes.

**TRN 4352 Case Studies in Transportation
Regulation 2** (3 q.h.)

Continuation of TRN 4351. *Prereq.* TRN 4351.

**TRN 4353 Case Studies in Transportation
Regulation 3** (3 q.h.)

Continuation of TRN 4352. *Prereq.* TRN 4352.

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Academic Policies and Services



Where to Get Help— Counseling Services

University College offers a wide variety of career and academic counseling services to assist students in making both educational and career decisions. The College does this by providing academic advisors and career counselors, by offering credit and noncredit career-planning workshops and special programs, and by serving as a link to other student support services offered by Northeastern University.

The services, courses, and programs outlined on the following pages have been designed with specific educational and/or career-planning issues in mind.

Academic and Counseling Services

Open House Programs

Individuals who are thinking about enrolling in University College for the first time are encouraged to attend an open house. Open houses introduce potential students to the many University College programs and services designed to meet the educational, job-related, and personal needs of adult, part-time students. They also orient new students to the University as a whole and address concerns that many students have about:

- course selection and registration
- financial aid
- student support services
- career planning

Students currently enrolled in University College are also invited to attend an open house.

Open houses ordinarily are scheduled each quarter at selected campus sites at or about the same time that registration takes place. Since

space is limited, persons who wish to attend should reserve a place by calling the Office of Academic and Student Affairs, telephone 617-437-2400.

Academic Advising

Academic advisors are available to talk with students about courses, transfer credit, degree requirements, and other matters of individual concern. University College advisors are present at the Boston and Burlington campuses weekdays from 8:30 a.m. to 7 p.m., by appointment.

At all other branch campuses, advisors are available by appointment on the evenings classes are in session, from 5:30 p.m. to 7 p.m. For an appointment at the Burlington campus, call 617-272-5500. For appointments at all other campuses, call 617-437-2400. During registration, advisors are available at all campuses to answer general questions. There is no charge for this service.

The Health Professions Advisory Committee provides counseling for students interested in taking courses to meet medical or dental school entrance requirements. For information on this type of counseling, call 617-437-2818.

Tutorial Services

University College offers tutorial assistance in several subjects. Tutoring, which is on a one-to-one basis, provides an opportunity for student and tutor to focus on specific problems that might not have been covered during class time. Students may request tutorial information from the Office of Academic and Student Affairs, 617-437-2400. A flyer describing tutorial services is also available at all campus locations.

Career Counseling Services

Career Counseling

Students in need of career counseling may call 617-437-2400 to arrange an appointment with a career counselor. This service is designed for students who need help in choosing a career or in developing effective job-hunting strategies. Career counselors also help students use additional services and programs offered by University College and by other offices at Northeastern

University. Additional career counseling services are provided by the Counseling and Testing Center. These services are described below.

Self-Assessment and Career Development

Often one of the strongest motivations for continuing education is the desire for career advancement or change. In order to help students develop career and educational planning skills, University College offers a 3-quarter-hour course in career development, *Self-Assessment and Career Development* (INT 4110). For more information, see the course description on page 148 of this *Bulletin*.

Job-Search Seminars

Each quarter the Career Development and Placement Office and the Office of Academic and Student Affairs offer a series of two-hour, evening, job-search seminars. The seminars are specifically designed for students who are currently looking for a job or anticipating a job change and who have identified the field or career area in which they would like to work.

These seminars are intended to help students assess their skills, develop effective job-search strategies, write résumés, and prepare for job interviews. Students who require assistance in making career decisions or are considering a career change should enroll in the *Self-Assessment and Career Development* course or make an appointment with a University College career counselor. Seminar schedules are announced in the student newsletter and in classes prior to each series. Students who wish to participate in the job-search seminars must reserve a place by calling the Department of Career Development and Placement at 617-437-2428.

Core Career Courses for Women

University College offers a special group of personal assessment and career development courses for women interested in a business career. Through these courses, women learn to match their skills and competencies to those needed in specific career areas in business. This process, in turn, helps a woman determine which specific jobs in business she is most suited to pursue. The courses are also designed to acquaint women with the organizational dynamics of business settings and to help them develop a

basic understanding of the quantitative and technical skills needed for various career areas in business.

A complete list of these courses may be found on page 148. They are open to any interested student.

Counseling and Testing Services

Location: 302 Ell Building

Telephone: 617-437-2142

Hours: Monday-Friday, 8:30 a.m.–4:30 p.m.

Tuesday, Wednesday, Thursday,

5:30 p.m.–8:30 p.m.

October–May

The Counseling and Testing Center at North-eastern provides a wide variety of services free of charge to all part-time students. Services for University College students include:

Personal Counseling

This involves discussing with a counselor such concerns as adjusting to being a college student (again or for the first time), getting along with people, feeling anxious or depressed, and problems concerning family, sex, drugs, or alcohol.

Educational-Vocational Counseling

This involves assisting students in making decisions about a choice of major or career. It typically involves an in-depth look at one's self, including one's strengths, aspirations, and values. Tests are often helpful in the process of self-understanding. The kinds of tests available include interest, ability, personality, and aptitude. This kind of planning is usually done individually with a counselor, although small groups may be organized if this approach seems more appropriate.

The goals of the Center's educational-vocational planning service complement those of the University College career-planning courses. Therefore, interested persons are encouraged to explore both options for career exploration and planning and then choose the service that seems best suited to their needs.

Study Skills Workshops

(Available during the day only.) Workshops are offered periodically to assist students in becoming more effective in organizing their time, in note-taking, in preparing for and taking exams, and in other areas related to effective academic performance.

Career and Graduate School Information

The Center maintains a reference room with information on a wide variety of careers and graduate and professional schools.

Career Placement Services

Location: 124 Ruggles Building

Telephone: 617-437-2428

Hours: Monday-Friday, 8:30 a.m.—4:30 p.m.

Tuesday, 8:30 a.m.—8 p.m.

October–May

The Office of Adult and Special Programs within Northeastern's Department of Career Development and Placement provides a number of free career placement services to all University College students. Among the services provided are evening job-search seminars, a reference library with company files and employee contacts, a job bank of employment opportunities, and panel presentations on careers of interest.

Students enrolled in a degree program are eligible for additional career services, such as job placement counseling, placement registration, and résumé referral to employers. In addition, seniors may take advantage of corporate, on-campus recruiting during the fall and winter quarters and a credential service for persons applying to graduate school.

The Placement Office is open one evening a week; additional evening hours may be arranged by appointment. Placement counselors also travel to the Burlington Suburban and Dedham campuses to see students by appointment. For more information, call 617-437-2428.

Admission and Registration

Open Enrollment

University College has an open enrollment policy that enables students to take most courses simply by registering for the course. Applications for admission, entrance examinations, and College Board Examination scores are not required. The open enrollment policy applies to both degree and nondegree students at University College. Credits earned for courses taken at University College may be applied to a degree program.

Students who are enrolled at University College and who decide to pursue a degree program must apply for admission to the program. See page 194 for more information on the admissions process. Special requirements apply to students entering the Bachelor of Science in Business Administration degree program. For information on the admissions process for this program, please see pages 21-24. Students must be admitted to a degree program in order to be eligible for financial aid. See page 203 for more information on obtaining financial aid.

Both degree and nondegree students are entitled to the student support services offered by University College.

Registration

Students may register for courses by reporting to any University College campus during the registration periods that are scheduled each quarter. It is not necessary to register at the campus where a particular course actually meets; students may register at any campus for a course scheduled at any other campus. All students must complete a registration form before attending class; attendance at class, even with the instructor's permission, does not constitute registration. Academic credit will not be awarded to students who are not properly registered. See the Academic Calendar on pages v-vii for a complete registration schedule.

Courses listed in this *Bulletin* are not necessarily offered each quarter. Each fall, winter, spring, and summer quarter the list of courses being offered is printed in a *University College Schedule Guide*. *Schedule Guides* are distributed at all campus locations. To request a schedule by mail, call 617-437-2400.

Quarter-Hour Credit

Northeastern University operates on a quarter-hour credit system. A quarter-hour credit is the equivalent of three quarters of a semester hour. Students who would like to take courses at Northeastern and then transfer these credits to another school are urged to receive permission from their advisor prior to registering.

Help with Course Selection

Academic advisors (see page 189) are available at all campuses, by appointment, to help students plan their academic programs and select courses. Students who have earned credits from other schools are urged to have their transcripts evaluated prior to the registration period to avoid duplicating course work completed elsewhere. During the official registration periods at all campuses, advisors are available without an appointment to answer general questions.

Prerequisites

Before registering for a course, students should read the course description in this *Bulletin* to determine if it is necessary to have taken a prerequisite course. In order to ensure academic success, students are strongly advised to adhere to course prerequisites.

Placement Tests

Placement tests are given to students enrolled in *Critical Writing I* (ENG 4110), *Business Writing and reports I* (ENG 4380), and *Technical Writing I* (TCC 4101) during the first class session. Some students may be requested to register for *Elements of Writing* (ENG 4011), a three-quarter-hour course offering additional help in writing, or *English for International Students* (ENG 4005, ENG 4006, or ENG 4007).

Students registering for *Mathematics I* (MTH 4110) must take a placement test on the first night of class. The results will determine if

the student should take *Basic Mathematics 1* and 2 (MTH 4001 and MTH 4002) prior to taking *Mathematics 1*. Students registering for *College Algebra 1* (MTH 4107) must also take a placement test at the first class meeting. Some students may be asked to register for *Introduction to Mathematics 1* and 2 (MTH 4081 and MTH 4082) for additional help in math.

International Students

Northeastern University is authorized under federal law to enroll nonimmigrant alien students. For information regarding eligibility to enroll in University College call 617-437-2400 or visit the International Student Office in 270 Holmes Hall, telephone 617-437-2310.

Maximum Course Load

New students may elect up to 12 quarter hours per quarter without special permission from the appropriate Program Director. Former students who are on the Dean's List may elect a maximum of 18 quarter hours per quarter without special permission.

Class Changes

University College reserves the right to cancel, divide, or combine classes when necessary. Although this policy ensures that students will almost never be excluded from a class because it is oversubscribed, it also means that a course may occasionally be canceled because of inadequate enrollment. Cancellations are more likely to occur among upper-level or advanced courses than among introductory courses. To avoid course cancellations, students are urged to preregister.

Pass/Fail Courses

Students may register for one elective course per quarter on a pass/fail basis. To be eligible for pass/fail status in a course, the student must be in good academic standing (not on academic probation) and must have completed 39 quarter hours of academic work. Thereafter, the student may register for one pass/fail course for each 15 quarter hours of successfully completed work. The student must also meet all prerequisites for the courses.

To be graded on the basis of pass/fail, the student must file a Pass/Fail Petition and have it

signed by an academic advisor. The Office of Academic and Student Affairs will send one copy to the Registrar, send one copy to the instructor, and retain one copy. Requests to take a course on a pass/fail basis must be made prior to the fourth class meeting.

Auditing Policy

Students are permitted to audit courses, but they must complete the usual registration forms and pay regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects, and take tests and examinations for informal evaluation. However, regardless of the amount or quality of work completed, academic credit will not be granted at any time for an audited course.

The student's decision to audit a course must be communicated in writing to the Registrar prior to the fourth class meeting. Exceptions to this procedure cannot be approved without authorization by the University College Academic Standing Committee.

Withdrawal Policy

Students who wish to withdraw from a course must complete a Course Drop Form in the Registrar's Office or notify the Registrar in writing of their intention to withdraw prior to the week in which final examinations are given. These forms are available at all campus locations. If, after the first class meeting, a student misses three consecutive meetings of a course, he or she will automatically be withdrawn from the course by the Registrar.

Students who withdraw or are withdrawn from a course will have no record of the withdrawal on their transcripts. See page 199 for information on tuition refunds.

Applying for Admission to a Degree Program

Students who wish to be admitted to University College as a degree candidate must follow one of the following procedures.

Option 1

In general, students who want to apply for admission to a degree program must have:

- 1 Completed at least 18 quarter hours of credit, which may include transfer credit. This credit must include English courses ENG 4110, ENG 4111, and ENG 4112 or their equivalents.
- 2 A minimum grade-point average of at least 2.0 (C) at University College.
- 3 A high school diploma or a high school equivalency certificate (GED).

Students who meet these requirements must file an application for admission in the Office of Academic and Student Affairs or at any branch campus. Applications may also be submitted by mail. Call 617-437-2400 to obtain an application. Students will be notified of their acceptance by mail.

Option 2

Students who want to apply for admission but do not meet the above requirements must:

- 1 Complete an application for admission.
- 2 Submit the completed application and the high school transcript or GED certificate to the Office of Academic and Student Affairs.
- 3 Arrange an admission interview with an academic advisor. Day, evening, and branch campus appointments may be arranged by calling 617-437-2400.

Students must be admitted to a degree program in order to be eligible for financial aid.

Note: Students who wish to be admitted to the Bachelor of Science in Business Administration degree program must meet additional requirements, as listed on pages 21-24.

Graduation Requirements

Except for certain health professions programs, the requirement for graduation from University College is 174 quarter hours for a bachelor's degree and 96 quarter hours for an associate's degree, with attainment of a quality-point average of 2.0 (an average grade of C). Although the credits allowed for acceptable work completed elsewhere by transfer students count toward fulfillment of quantitative graduation requirements,

neither the credits nor the grades earned in such courses are included in the quality-point computations for graduation. Course requirements for each degree are different and are outlined in this *Bulletin*.

Course Substitutions and Waivers

Students may request to have a required course in an academic program waived and to substitute another course in place of the required course. Such requests are not encouraged, although the University recognizes that students may occasionally have very good reasons for requesting such waivers. To request that a required course be waived, students must complete a Petition for Course Substitutions and Waivers and submit it to the Office of Academic and Student Affairs. Petitions are available at each campus location. Petitions are routinely forwarded to the appropriate Program Director. The Program Director reviews the request and notifies the student of the outcome. A copy of the completed request is kept in the student's file in the Office of Academic and Student Affairs.

Graduation with Honor

Bachelor's degree candidates who have demonstrated distinctly superior academic achievement will be graduated with honor, high honor, or with highest honor, depending on the final quality-point average obtained. To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at University College. Courses transferred from other educational institutions are not considered in determining honor graduates.

Residence Requirement

Every candidate for the bachelor's or associate's degree must fulfill the minimum residence requirement. The residence requirement is defined as the satisfactory completion of at least 45 quarter hours of course work in University College immediately preceding graduation. At least 12 of the 45 quarter hours must be in the candidate's major field of study.

Since University College requires the completion of at least 45 quarter hours of credit in residence immediately preceding graduation, students may not take courses at any other institu-

tion during their senior year for the purpose of transferring credit.

Students whose enrollment in a degree program is interrupted for a period of one year or more will be reinstated in that program at the time of re-entry into University College.

In Absentia Status

If a student moves beyond a reasonable commuting distance from University College or its branch campuses but has completed 135 or more quarter hours of credit (including a maximum of 60 quarter hours of transfer credit), the Committee on Academic Standing will consider a petition to allow the student to complete his or her requirements for a University College degree at another approved college. The remaining courses must be completed within two years of the date of official approval of the student's *in absentia* status.

Senior Status Procedure

All potential graduates are polled during the fall quarter to determine their intention to graduate during the current academic year. To be considered for graduation in June, a student must return a Commencement Data Card prior to the start of the winter quarter of the academic year in which he or she expects to graduate. September graduates are polled during the month of June.

Throughout the academic year, the Office of Academic and Student Affairs issues Senior Status Reports on request to potential graduates in order to assist them with the selection of courses required for program completion. Seniors are encouraged to request a Senior Status Report during the summer prior to the academic year in which they plan to graduate. Petition forms for status reports are available at each campus location.

Credit by Examination During the Senior Year

CLEP or PEP examinations (see page 195) may be taken by students during their final year of study provided they have met the 45-quarter-hour residence requirement for graduation described above. Because of the time required for CLEP and PEP examinations to be graded and returned to the University, students requesting

June graduation must take their CLEP and PEP examinations no later than the winter quarter of their senior year.

Transfer Credit Policy

Students may transfer credit from accredited institutions of higher education when courses completed are applicable to the student's program in University College. The minimum course grade acceptable for transfer credit is C, or 2.0 on a four-point scale. An accredited institution of higher education is an institution having recognition and membership in one of the six regional accrediting associations recognized by the Council on Post-Secondary Accreditation.

Transfer Credit Procedure

Students who would like to obtain an evaluation of credits earned from another institution must file a Transfer Credit Petition with the Office of Academic and Student Affairs. The student must then write to the Registrar of the institution previously attended and request that an official transcript (one bearing that institution's seal) be forwarded to the Office of Academic and Student Affairs, University College, Northeastern University, 360 Huntington Avenue, Boston, MA 02115. Upon receipt of official transcripts, the Office of Academic and Student Affairs issues an evaluation of all credits as they apply to the student's program in University College. Official awarding of credit is recorded on the student's University College transcript when admission to a degree program is approved.

Validation of Required Upper-Level Business Courses for Transfer Credit

Students entering the Bachelor of Science in Business Administration degree program may be required to validate required upper-level business courses that they have taken outside the framework of the program.

"Validation" is the set of procedures that tests whether an upper-level course completed at the lower division of a bachelor's degree program should be accepted for transfer credit in the upper division of a bachelor's degree program recognized and approved by the American Assembly of Collegiate Schools of Business. The

Bachelor of Science in Business Administration program offered by University College conforms to all standards established by the American Assembly of Collegiate Schools of Business (AACSB). AACSB has been recognized by the Council for Post-Secondary Accreditation and by the United States Office of Education as the sole accrediting organization for university bachelor's and master's degree programs in business administration.

In general, students are able to validate previously earned course credits by taking a sequential course in a reserved section, a department-approved examination, or a CLEP (College Level Examination Program) or PEP (Proficiency Examination Program) examination.

For more information on course validation, see page 22. Students should talk with a University College academic advisor for information about the validation of upper-level business courses for transfer credit.

Evaluation of International Educational Credentials

Students requesting an evaluation of international educational credentials for transfer credit at University College will be charged a fee of \$40. The evaluation is issued by the Office of Academic and Student Affairs upon receipt of a Transfer Credit Petition, a completed Educational Chronology Form, official copies of all transcripts translated into English, and a check in the amount of \$40, payable to Northeastern University. The official assessment of international educational credentials is made in accordance with current standards for awarding transfer credit at University College or as recommended by the Center for International Higher Education Documentation. The fee is waived for any University College student who has enrolled in a degree program prior to requesting the evaluation.

Course(s) at Another College or University

Students who are enrolled at University College and want to complete one or more courses at another institution for transfer purposes must first file a petition to enroll in such courses with the Office of Academic and Student Affairs. Courses taken at other institutions may be disallowed unless a petition has been submitted and

approved. Seniors (students in their final year of study at University College) should refer to information about the residence requirement, described on page 193.

Credit by Examination

University College awards credit by examination, provided the examination does not duplicate previously earned academic credit. Credit is granted for successful completion of examinations currently available through the College Level Examination Program (CLEP) of the College Entrance Examination Board and through the Proficiency Examination Program (PEP) of the American College Testing Program. Both programs have been designed to help students obtain college-level credit for knowledge acquired through nontraditional means, such as on-the-job training; educational television; or correspondence, extension, or independent study. Information about these programs is available from the Office of Academic and Student Affairs at University College and from the Northeastern University Counseling and Testing Center.

Modern Language Proficiency Examination

Students may be eligible to receive credit for proficiency in a modern language. Examinations are currently offered in French, Spanish, German, and Italian. Students should contact the Liberal Arts Program office, telephone 617-437-2416, for more information.

Noncollegiate Experience Credit

Some liberal arts students may petition for noncollegiate experience credit. See page 84 for details.

Noncollegiate experience credit is not available for business courses, except through CLEP or PEP examinations. (See Credit by Examination, above.)

Credit cannot be awarded through Noncollegiate Experience Petitions or examinations when an appropriate examination is available through CLEP or PEP.

Credit for Extra-institutional Learning

Extra-institutional learning is learning that takes place outside the sponsorship of legally authorized and accredited post-secondary educational

institutions. The term applies to learning acquired from formal courses sponsored by associations, governments, business, and industry.

In awarding credit for extra-institutional learning, University College uses the *National Guide to Credit Recommendations for Noncollegiate Courses*, published annually by the American Council on Education.

Students applying for credit for extra-institutional learning must submit a Transfer Credit Petition and provide official credentials from the sponsoring noneducational organization to the Office of Academic and Student Affairs. The credit may be applied toward degree requirements at University College if recommended in the *National Guide*, provided credit is not otherwise obtainable through CLEP, PEP, or noncollegiate experience credit programs at University College.

Grading System

A student's work in each course is evaluated by the instructor, who awards a letter grade at the end of the quarter. This grade is officially recorded by the Registrar's Office. The grades and symbols used are given below, together with the numerical equivalents used for computing quality-point averages:

A	(4.000)
A-	(3.667)
B+	(3.333)
B	(3.000)
B-	(2.667)
C+	(2.333)
C	(2.000)
C-	(1.667)
D+	(1.333)
D	(1.000)
D-	(.667)
F	(0)
I	Incomplete
L	Audit (no credit)
S	Satisfactory (pass/fail grade)
U	Unsatisfactory (pass/fail grade)
X	Incomplete (pass/fail grade)
*	Grade not received

Grade Reports and Transcripts

All efforts are made to mail grades prior to the beginning of the following quarter. A supplementary grade report is issued when a missing grade or a grade change is received. University regulations prohibit issuing grades by telephone. Grade reports of degree candidates indicate both their quarterly quality-point average and their cumulative quality-point average.

Students may obtain a transcript of their grades by making a request in writing to the Registrar's Office, 120 Hayden Hall, Northeastern University, 360 Huntington Avenue, Boston, MA 02115. Unofficial transcripts are issued free of charge; official transcripts bearing the University seal cost \$2.

Quality-Point Average

The method of figuring the quality-point average is: the numerical equivalent of each grade received is multiplied by the credit hours earned; the quality points are added together, then divided by the student's total quarter hours. An example follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.000	3	12.0
B-	2.667	3	8.0
C	2.000	6	12.0
F	0.000	3	0.0
$\frac{\text{Quality-Point Average}}{\text{Average}} = \frac{\text{Total Quality Points (32.0)}}{\text{Total Credit Hours (15)}} = 2.13$			

Pass/fail grades (S, U, and X), incompletes (I), and audits (L) are not included in the quality-point average. Similarly, transfer credits are not included in quality-point averages. However, the total earned hours appearing on the student's transcript include both transfer credits and S grades.

A cumulative grade-point average below 2.0 is unacceptable and does not allow a student to continue in University College or to receive a degree from Northeastern University. The F grade is a failure and requires repetition of the course in its entirety.

Academic Monitoring

Degree candidates with 45 quarter hours of credit are monitored quarterly. Those whose quality-point average fall below 2.0 are contacted

and offered all possible assistance by the Office of Academic and Student Affairs. They will continue to be monitored until their quality-point average is 2.0 or better. Students who feel they would benefit from academic assistance are encouraged to call 617-437-2400 to arrange an appointment with an advisor.

The I Grade

The I grade, or incomplete, may be given only when the student fails to complete a major requirement of a course, such as a term paper or a final exam, but has been in regular attendance. Students who have missed a substantial number of class meetings without the instructor's permission receive a grade of W. An instructor may decide that a student has done so poorly in the course that even a perfect grade in a make-up final examination could not raise the grade from F; in this case F is the proper grade, regardless of the missed final examination.

All deficiencies must be made up in the manner prescribed by the instructor no later than 12 months following the recording of the I grade. Students requesting an exception to this policy must petition the University College Academic Standing Committee in writing. A student may also elect to repeat the course at his or her expense.

Pass/Fail Grades

Satisfactory completion of work in all courses taken on a pass/fail basis is designated on the transcript by the letter S. Unsatisfactory work is designated on the transcript by the letter U. Any unsatisfactory grade must be handled according to the existing policy of University College but may never be cleared by enrolling in the same course on the basis of the pass/fail system of grading.

An incomplete in a course taken on a pass/fail basis is designated by the letter X on the transcript and is treated according to the normal procedure for grades of incomplete.

Dean's List

All degree candidates who have taken a minimum of 27 quarter hours in three consecutive quarters (for example, fall, winter, and spring) and who have completed all their courses with a quality-point average of 3.0 or better are placed

on the Dean's List. These students receive certificates of commendation from the Dean of University College. See page 193 for information on graduation with honor.

Attendance, Homework, and Examinations

Students are expected to attend all meetings of the classes in which they are registered unless excused in advance. Absence from regularly scheduled classes seriously affects the student's academic standing. A student who is consistently absent from class will be withdrawn from the course by the Registrar. All students who are absent from school because of extended illness and who do not wish to be withdrawn should inform the Registrar's Office in writing.

Homework

The specific work required for each course in University College is determined by the instructor. In general, it is expected that University College students spend an average of six to eight hours per week outside of class on assignments for each course. Students who are absent are responsible for obtaining their homework assignments from their instructors or from other students. Homework assignments are not available from the Office of Academic and Student Affairs.

Examinations

Tests are scheduled throughout each quarter at the option of the instructor and are regarded as part of the term's course work. A final examination is held at the end of each quarter in each course unless an announcement is made to the contrary.

Missed Final Examinations

Students who miss a final examination are given a grade of I (incomplete). Students do not automatically have the right to make up a missed final examination. Students must petition for this privilege and pay a fee of \$40 for each make-up examination. Petitions are available at each campus location. Students are notified whether or not their petition has been approved prior to the date of the make-up examination.

Students who make up a missed final examination will have the appropriate letter or pass/fail grade substituted for the I grade on their transcripts.

Miscellaneous Policies

Students' Rights and Responsibilities

The University subscribes to the view that all students have certain rights and freedoms. For these reasons, the University has adopted and published specific policies and procedures governing student rights and freedoms, general conduct, student discipline, disclosure of information from student records, and University judicial procedures. Judicial procedures are related to issues of discipline and conduct, the right of students to appeal judgments of their academic performance, grievances based on the fact that a student is handicapped, and allegations of sexual harassment. All policies and procedures governing the above matters may be found in the *University College/School of Engineering Technology Student Handbook*. Copies are available in the Office of Academic and Student Affairs or by calling 617-437-2400. In general, copies are also available at each branch campus location.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits students to inspect their records whenever appropriate and to challenge specific parts of them when they feel it necessary. Specific details of the law as it applies to Northeastern are available in the *University College/School of Engineering Technology Student Handbook*.

Disciplinary Action

The Committee on Regulations and Discipline has the authority to dismiss, place on probation, or remove from the list of degree candidates any student who, because of disruptive or illegal conduct or poor character, is considered an unsuitable member of the College community. The Committee on Regulations and Discipline is an *ad hoc* subcommittee of the University College Committee on Academic Standing. It is convened at the request of the Committee on Academic Standing.

Change of Address

Change of address and/or name should be reported in writing immediately to the Registrar's

Office, 120 Hayden Hall, Northeastern University, 360 Huntington Avenue, Boston, MA 02115.

Attendance at Commencement

Attendance at commencement for all University College degree candidates is optional. Degree candidates are polled regarding their intention to attend commencement by the Northeastern University Commencement Committee during the spring quarter.

Changes in Requirements

The continuing development of University College requires frequent revisions of the curricula. When no undue and unusual hardship is imposed on students because of these changes, students are expected to meet the requirements of the most current *Bulletin*. If a particular student finds it impossible to meet those requirements, the *Bulletin* for the year in which he or she declared a major is binding.

Academic programs, course content, and rules and regulations are subject to change without notice.

Tuition and Fees

Tuition and fees are refundable only as stated under "Refund of Tuition." Checks and drafts for all charges are to be made to the order of Northeastern University.

Tuition for all credit courses is \$85 per quarter hour of credit. Charges for registration and tuition for special courses are at the rate specified for each course. There is no reduction in fees for auditing courses.

Noncredit courses are charged at quarter-hour rates comparable to those of credit courses meeting on an equivalent contact-hour schedule.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

It is the student's responsibility to ensure that all tuition charges and fees are paid when due. If a bill has not been received prior to the start of classes each quarter, the student should come in person to the Bursar's Office, where a bill will be processed.

Any discrepancies in billing should be immediately brought to the attention of the Bursar's Office. If there is a billing problem, the undisputed portion of the bill should be paid on time to avoid any additional late fees. Failure to receive a bill through the mail or to pay the undisputed portion of the bill is not justification for late payment of amounts actually owed.

Students will not be advanced in class standing or permitted to re-enroll in the University nor will degrees be conferred until all financial obligations to the University have been met.

Tuition for Courses in Other Northeastern Departments or Colleges

University College students assigned to courses in other departments or colleges of the university are charged the tuition fees effective in the departments or colleges in which they are enrolled.

Initial Registration Fee

A nonrefundable \$10 registration fee for first-time students is billed with tuition fees.

Tuition Budget Payment Plans

Occasionally situations develop—usually beyond the control of the student—that make it difficult to meet the payments in the manner outlined above. Under such circumstances, the student is advised to contact the Bursar's Office to arrange for deferred payment. The only deferred payment plan offered is as follows and applies only to the amount owed for the current quarter:

First payment	1/3 due first week of quarter
Second payment	1/3 due approx. fourth week of quarter
Balance	1/3 due approx. eighth week of quarter

Such arrangements should be made before the end of the first week of the quarter or within one week of the date of registration if the student enters late. Deferred payment of tuition entails a fee of \$10, which is levied on all accounts not paid by the end of the second week of classes. Failure to take immediate action will result in a late payment fee of \$50.

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is

to be made directly by the employer to the University, the student should furnish the Bursar's Office with a purchase order covering registration or a statement from an officer of the company certifying that the company is underwriting the tuition. In cases where students are being reimbursed by their employer, tuition must be paid by the student according to the prescribed regulations to avoid late payment charges.

Veterans' Benefits

Any veteran covered by Public Law 89-358 should report to 126 Hayden Hall to fill out the proper enrollment forms.

Late Payment Fee

Bills for tuition and fees are payable in accordance with the due date shown. A late payment fee of \$50 is charged for failure to make payments in accordance with the prescribed regulations.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition is as follows:

The University provides all instruction on an academic-quarter basis, for which students pay at the beginning of each quarter. Tuition refunds are granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in 120 Hayden Hall. Nonattendance does not constitute official withdrawal.

Refunds are granted in accordance with the following schedule:

Official withdrawal filed within	Percentage of tuition
First week of quarter	100%
Second week of quarter	75%
Third week of quarter	50%
Fourth week of quarter	25%

Student Center Fee

All students in University College on the Huntington Avenue campus are charged \$.75 each quarter for the services available in the Student Center.

Laboratory Fees

Students enrolled in courses that carry a laboratory fee must purchase a Laboratory Fee and Deposit Card from the Cashier's Office (\$15 for extra cards).

A fee of \$40 is charged for biology courses and for those health professions courses that include a laboratory. For chemistry courses, cards cost \$40 per quarter with the possibility of a \$5 refund at the end of the quarter, depending on breakage. Upon completion of the course or withdrawal during the quarter, the student must check his or her status with the laboratory attendant. The Cashier's Office will then refund any unused balance shown on the card.

A laboratory fee of \$40 is also charged for film and photography courses, for some art studio courses, for arts and crafts courses, and for law enforcement students who enroll in a forensic laboratory. A \$40 fee is charged for the food preparation course in the hotel and restaurant management program.

Music students enrolled in a music tutorial pay a special rate. For details contact Charles Mokotoff, University College Music Coordinator, 307 Ell Building, telephone 617-437-2440 or 437-2442.

Graduation Fee

The University graduation fee, charged to those who are candidates for the bachelor's or associate's degree, is \$40, payable on or before May 1 of the year in which the student expects to graduate.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "Missed Final Examination." The fee for each examination requested by the student is \$40. The fee must be paid when the petition is filed in the Office of Academic and Student Affairs.

Transcripts

Students may request official transcripts of their grades at the Registrar's Office. There is a charge of \$2 per copy, payable in advance. Unofficial transcripts are issued free of charge.

Scholarships

The following University College and School of Engineering Technology scholarships and awards are available to students who have been accepted as degree candidates and are in good academic standing.

Scholarships are awarded once a year by the Scholarship Committee. Final selection of scholarship recipients is usually made in late May, followed by the awarding of the scholarships in late June or early July. Funds are usually applied to tuition expenses for the following academic year. Awards range in amount from \$250 to \$700.

Application Procedure

In January, a mailing list of students who have requested applications is prepared and applications are mailed out with the stipulation that they be completed and returned to the Office of the Dean by March 31. A student can be placed on the January mailing list by calling 617-437-2400 and leaving his or her name, address, and student ID number with the receptionist.

Electronics Industries Personnel Association Scholarship

This scholarship was established in 1980 through the generosity of the Electronics Industries Personnel Association. The income is awarded annually to one or more students whose studies, to a significant extent, are in the field of human resources management at University College. Recipients shall demonstrate financial need, soundness of character, and academic stability.

Eva Needle Memorial Scholarship

The Eva Needle Memorial Scholarship Fund was established in 1965 with the aid of the Norman Knight Charitable Foundation and is maintained through the generosity of the friends of Bob and Ted Needle in memory of their mother. The income from the fund is awarded annually to a deserving student in the accounting program

who demonstrates superior academic achievement. The recipient is selected jointly by Ted Needle, a long-standing member of University College's accounting faculty, and the Scholarship Committee.

H. Patricia Taylor Scholarship Fund

The H. Patricia Taylor Scholarship Fund was established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of Business. The scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree and is an attempt to provide similar funds to assist others in realizing their potential through higher education. The income from the fund is awarded annually to a student enrolled in University College or the School of Engineering Technology who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

Harry Olins Memorial Scholarship

The Harry Olins Memorial Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for." The fund, presented by Mrs. Olins in recognition of her husband's long service on the business faculty, makes available an annual tuition award to students who, in terms of scholastic achievement, character, and personal need, best typify the spirit of Northeastern University. To be eligible for this award, the student must be a business administration degree candidate and carry a full academic load during the school year.

Kappa Tau Phi Scholarships

The Kappa Tau Phi Sorority Scholarship Fund annually makes scholarship awards available to women students in the science, business, engineering, and liberal arts programs who rank highest at the end of the upper-middle year. In the event that the chosen student is eligible for an award of greater monetary value, the award is made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a course meeting at least two evenings per week and must be a can-

didate for a bachelor's degree. In determining the recipient, grades of all courses completed in prior years shall be considered.

Martin Luther King, Jr., Scholarships

This scholarship fund was established in 1969 in memory of the late Reverend Martin Luther King, Jr. Awards are made, as openings occur, to a limited number of adults from minority groups who would otherwise be unable to continue their education. Stipends can cover tuition expenses not to exceed 6 quarter hours in any academic quarter (excluding summer quarter). Northeastern University's Office of Financial Aid, located in 254 Richards Hall, administers these scholarships.

Professor Joseph A. Mullen Scholarship

The Massachusetts Chapter of the American Society for Training and Development has established a fund to provide annual scholarship awards to deserving part-time students upon the recommendation of the Dean of University College.

Roberta Macycove Wasserman Memorial Scholarship

This scholarship was established in 1976 through the generosity of family members and friends of Roberta Macycove Wasserman, who, at the time of her death in 1975, was pursuing liberal arts studies within University College. The income from the fund is awarded annually to a deserving female student who is a homemaker with family responsibilities and who is pursuing part-time studies within University College. The recipient shall demonstrate financial need, soundness of character, and academic stability.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to undergraduate students of University College or the School of Engineering Technology. Eligible students must have a cumulative quality-point average of 3.0 or better after completing 75 percent or more of their required studies.

Timothy F. Moran Scholarship Fund

This scholarship fund was established upon the retirement of Dean Timothy F. Moran, Associate Dean at University College and Director of the Law Enforcement programs. During his second career as an educator, Dean Moran, a retired state police officer, was an innovator and leader in the education of law enforcement officers both in New England and throughout the world. His former students, colleagues, and friends made substantial contributions to establish this fund in his honor. This scholarship is awarded annually to students majoring in law enforcement, security, or corrections who demonstrate academic excellence and financial need.

Transportation Club of New England Scholarship

The Transportation Club of New England provides approximately eight scholarships annually for persons employed in transportation and industry traffic departments. Scholarships are applicable toward tuition, books, and incidental expenses involved in transportation management courses. Their purpose is to afford a limited number of people an opportunity to expand and improve their education by systematic study of transportation and distribution management. Scholarships are administered cooperatively with the Scholarship Committee of the Transportation Club of New England. Applications may be secured from and filed with Frank Smith, Secretary, Transportation Club of New England, P.O. Box 121, Reading, MA 01867. Each applicant must be sponsored by a member of the Transportation Club.

University College and the School of Engineering Technology Faculty Society Memorial Scholarship Awards

The Faculty Society of University College and the School of Engineering Technology offers two awards annually, primarily for excellence in studies, to bachelor's degree candidates in University College and the School of Engineering Technology who have carried and are currently carrying a minimum of 24 quarter hours annually. Applications, available during the winter quarter, must be returned before the spring quarter. These awards are given in commemoration of the Faculty Society's deceased members.

U.S. Navy Field Training Supervisors Association Memorial Scholarship

A scholarship fund has been established through the generosity of the U.S. Navy Field Training Supervisors Association in commemoration of the Association's deceased members. The scholarship is awarded annually to a deserving student, selected by the Scholarship Committee, who is a management major working toward a bachelor's degree in the evening program at University College.

Vincent A. Forte Memorial Scholarship

This scholarship was established in 1985 in memory of Vincent A. Forte, a graduate of Northeastern University. The endowment funds were provided through the generosity of his family, friends, and associates. Forte was an ambitious student pursuing a full-time business career while attending school part-time. He received an associate's degree from Lincoln Institute in 1957, a Bachelor of Business Administration degree in 1958, and a Master of Business Administration in 1967. The income from this fund is awarded to undergraduate students in University College who are pursuing a bachelor's degree in business, who demonstrate financial need, and who are maintaining a cumulative quality-point average of 3.0 or better after completing at least 44 quarter hours of credit.

William J. McGovern Memorial Scholarship

The William J. McGovern Memorial Scholarship was established in 1978 by an anonymous donor to honor the memory of William J. McGovern. The donor wishes to assist others in realizing their potential through higher education. The income from this scholarship benefits worthy undergraduate students actively pursuing studies in University College or the School of Engineering Technology. Recipients must have declared a major, demonstrate financial need and academic achievement, and exhibit a high level of professional promise.

Awards

John W. Robbins Prize

The John W. Robbins Prize was established in 1984 under the terms of the will of the late Lena C. Robbins, in memory of her husband, John W. Robbins, an alumnus of Northeastern University. The income from this memorial gift is awarded annually to the outstanding student (Class Marshall) of the graduating class of University College.

Financial Aid

The Office of Financial Aid, located in 254 Richards Hall, offers several types of assistance to part-time students. All awards are based on financial need. Aid granted from programs sponsored by the federal government is dependent upon the amount of funding allocated to Northeastern University. The University does not award financial assistance in any form to students who are not citizens or permanent residents of the United States. All part-time students who wish to apply for financial aid and who have not declared a major must submit a Certification of Intention to Complete a Degree Form, available at the University College Office of Academic and Student Affairs, 180 Ruggles Building.

Satisfactory Academic Progress for Financial Aid Recipients

Recipients of financial aid are required to make satisfactory academic progress in order to continue their eligibility for aid. University College defines "satisfactory academic progress" as:

- a minimum course load of 6 credit hours per quarter
- a minimum average of C, or 2.0, in these courses
- a cumulative academic record in any given academic year (September through June) that reflects that the financial aid recipient has registered for a minimum of 18 quarter hours of credit and satisfactorily completed at least 12 quarter hours of credit with an overall quality-point average of 2.0 or better

If, at the end of any given academic year, a student receiving financial aid has failed to make

satisfactory academic progress toward his or her degree, the Office of Financial Aid will be notified by University College.

Pell Grant

The Pell Grant Program is a federal aid program designed to provide financial assistance to degree candidates who need it to attend post-high school educational institutions. Pell Grants are intended to be the "floor" of a financial aid package and may be combined with other forms of aid in order to meet the full costs of education. The Pell Grant is an award and, unlike a loan, does not have to be repaid. Half-time students taking at least 6 credit hours each quarter may apply for awards ranging up to one half the maximum allowable by law, contingent upon the total cost of education. Students must also have a high school diploma or GED and be enrolled with the intention of receiving a degree or a certificate. Applications are available in the Office of Financial Aid, 275 Richards Hall, or by writing to the Pell Grant Program, P.O. Box 84, Washington, DC 20044.

Massachusetts State Scholarship

Massachusetts residents enrolled as full-time students (i.e., taking 12 credit hours per quarter for fall, winter, and spring) may be eligible for a Massachusetts State Scholarship. To apply, students must submit a Massachusetts Financial Aid Form (MFAF) for residents of Massachusetts. The deadline date for applications is March 1. Massachusetts State Scholarships are awarded based on need as determined by the Massachusetts Financial Aid Form.

Adult Learners Program

The Massachusetts Board of Regents of Higher Education has established the Massachusetts Adult Learners Program as a need-based, state-funded, financial aid program designed primarily to assist Aid for Dependent Children (AFDC) recipients in obtaining a college education. The amount of each award varies depending on the applicant's demonstrated need. The maximum award is the same as the Massachusetts State Scholarship, which is \$1,460.

To be considered for the program, applicants must be full- or part-time undergraduate students at Northeastern, taking at least one

3-quarter-hour course. They must also have been permanent, legal residents of Massachusetts for one year prior to receiving the award.

Awards are made only to current AFDC recipients and are made on a first-come, first-served basis. Applications are available at the Office of Financial Aid.

Guaranteed Student Loan Program

The Guaranteed Student Loan Program enables a student to borrow a maximum of \$2,500 per academic year directly from a bank, credit union, or other participating lender in the student's home community. The loan is guaranteed by a state or private nonprofit agency and is insured by the federal government. The interest on the loan will be subsidized by the federal government while the student is in school. **This loan must be repaid.**

Students whose families have an adjusted gross income below \$30,000 will be eligible for a loan if they are enrolled or have been accepted for enrollment at least half time in an institution of higher education and are citizens or nationals of the United States. Students whose families exceed this income ceiling may be eligible if they can show financial need in accordance with U.S. Department of Education guidelines. All students are eligible for federal interest benefits. Under these benefits, the federal government will pay the interest until the student begins repaying the loan.

The legal maximum loan borrowed through the Guaranteed Student Loan Program for any single academic year is \$2,500. The maximum loan for an entire undergraduate program is \$12,500.

The maximum loan amount in one academic year may never exceed the cost of education, less other financial aid received. In practice, however, the Guarantee Agency in the state where the loan is written may set loan limits less than these maximums. In the final analysis, the lender decides the amount of the loan.

Repayment of a Guaranteed Loan usually begins six months after a student withdraws or graduates from an educational institution or ceases to carry at least a half-time course load. The repayment period may be as long as ten years. The amount of the payments depends

upon the size of the debt and the student's ability to pay; in most cases, the borrower must pay at least \$600 per year.

During the repayment period, the loan carries a simple interest rate of 8 percent per annum, which is paid by the borrower.

Note: *For students who have previously participated in the Guaranteed Student Loan Program and who have outstanding loans at 7 or 9 percent, the interest rate on subsequent loans will continue to be 7 or 9 percent.*

Repayment on loans may be deferred if the borrower returns to at least half-time study at an eligible educational institution. Deferment of repayment is also allowed for up to three years of service in the armed forces, Peace Corps, or full-time programs conducted by ACTION. In most cases, the actual repayment schedule will be established by the lender shortly after the borrower leaves school.

Students who borrow funds through the Guaranteed Student Loan Program are subject to the legal responsibilities listed below:

- 1 Students must report any of the following changes to the lending institution:
 - a withdrawal from school
 - b transfer to another school
 - c reduction of course load to less than half time
 - d change of address or parents' address
 - e change of name
- 2 Students are liable for any false information that they report on the application.
- 3 Students must use the loan funds for educational purposes only.
- 4 If a student fails to repay the loan as agreed under the Federally Insured Loan Program regulations, legal action can result.

Failure to comply with any of the above responsibilities could make a student ineligible for any future loans from the program.

Additional information about financial aid is available from the Office of Financial Aid, 254 Richards Hall, 617-437-3190.

All federal financial aid programs are subject to change depending on adequate and continuing federal support.

Student Activities

Purpose

The purposes of part-time student activities are to provide opportunities for the development and pursuit of cultural interests and professional objectives, to encourage the development of leadership activities and skills, to enable the student to identify more closely with the University, and to include the family as an important and vital motivating force in the part-time student's educational career.

Students who are interested in starting clubs related to their careers and professional goals should call the Office of Academic and Student Affairs, telephone 617-437-2400, for more information.

Sigma Epsilon Rho Honor Society

Sigma Epsilon Rho is the University College honor society. Its purposes are to promote acquaintance and good fellowship among those students who have attained highest scholastic standing in the College; to stimulate the student body to higher scholastic accomplishment through the bearing, influence, and work of these selected men and women; to develop methods of mutual improvement and advancement among members; and to support high moral, professional, and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the Society. Admission is by invitation after nomination by the Society.

Gymnasium Facilities

Part-time students may use the gymnasium facilities from 4 to 9:30 p.m., Monday through Friday, and during all open hours on Saturday, Sunday, and holidays. A valid Northeastern student identification card and a photo identification card must be presented to gain access to the facilities.

Specific schedules for use of the pool, Nautilus and Universal weight rooms, indoor track and cage, gymnasium, gymnastics room, and wrestling room are available at the beginning of each quarter in the Intramural Sports Office, 110 Cabot.

Alumni Association

More than 100,000 alumni are united within the Alumni Association, created to establish a mutually beneficial relationship between Northeastern and its graduates. The Association is governed by an Executive Committee elected from the alumni community. Membership in the Association is automatic upon graduation.

The Association is headquartered in the Office of Alumni Relations, 125 Richards Hall. The official records and addresses of alumni are maintained in the Office of Alumni Records, 411 Huntington Plaza.

Activities of the Association include the Homecoming celebration, presentation of the Outstanding Alumni Awards, and the annual presentation of Professional Promise Awards to outstanding seniors in each of the Colleges. The Alumni Office also is involved in establishing diverse enrichment and education programs to meet the contemporary vocational and avocational needs of Northeastern's graduates. The Alumni Association has also initiated a successful group travel program to provide the alumni of Northeastern with interesting, economical opportunities in foreign travel. Notice of all activities is provided in the Northeastern alumni magazine and in special publications.

Regional alumni clubs have been established from coast to coast. All alumni are eligible to become members of these organizations. The clubs meet periodically with a varied program, often in conjunction with professional and athletic events, faculty visits, and service projects. Alumni class organizations conduct reunions for their respective classes every five years.

The Association also sponsors and assists constituent organizations that focus on common professional and avocational interests and college affiliations. These groups have their own officers and conduct various programs throughout the year.

In addition, alumni volunteers in many metropolitan areas across the nation represent the Admissions Office at high schools and community colleges.



General Information

The University

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, a body of nearly 200 distinguished business and professional men and women.

From its beginning, Northeastern University's dominant purpose has been to identify community educational needs and to meet those needs in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its cooperative plan of education, under which students alternate periods of work and study. This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and to contribute to the financing of their education. All of Northeastern's undergraduate day colleges operate on the cooperative plan, which requires five years for the student to earn a degree. The College of Arts and Sciences also offers a four-year, non-cooperative option. Several of Northeastern's graduate schools have structured their programs to include the features of cooperative education.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult day courses leading to certificates and to associate's and bachelor's degrees. In addition to offering day undergraduate programs in computer technology, electrical engineering, and

mechanical engineering technology, the School of Engineering Technology offers evening/part-time certificates, associate's degree, and bachelor's degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College facilities concerned and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at Northeastern's campuses in Boston, Burlington, and Dedham. Evening courses are also scheduled in Belmont, Brockton, Chelmsford, Framingham, Lynnfield, Marlboro, Marshfield, Milford, Revere, Westwood, and Weymouth.

For more information about the undergraduate colleges, their programs, or the cooperative plan of education, contact the Admissions Office, Northeastern University, 360 Huntington Avenue, Boston, MA 02115, telephone 617-437-2200.

Undergraduate Colleges

Boston-Bouvé College of Human Development Professions

Offers programs leading to the Bachelor of Science in Education in early childhood education, elementary education (with a minor in special education), human services, physical education, school and community health education, secondary education, and speech and hearing; the Bachelor of Science in Recreation and Leisure Studies; and the Bachelor of Science in Physical Therapy. For more information, call 617-437-2200.

College of Arts and Sciences

Offers programs in the arts, humanities, social sciences, and mathematics/sciences leading to the Bachelor of Arts and Bachelor of Science degrees. Programs are normally four years in length on a full-time plan or five years in length on the cooperative plan. For more information, call 617-437-3980.

College of Business Administration

Offers a five-year, cooperative education program leading to the Bachelor of Science in Business Administration. Students complete a six-course concentration in accounting, human

resources management, marketing, finance and insurance, management, international business administration, entrepreneurship and new venture management, transportation and physical distribution management, or a self-designed concentration. For more information, call 617-437-2200.

College of Computer Science

Offers a five-year, cooperative education program in computer science leading to the Bachelor of Science in Computer Science. Areas of concentration include artificial intelligence, data bases, languages, and systems. For more information, call 617-437-2462.

College of Criminal Justice

Offers a five-year, cooperative education program leading to the Bachelor of Science degree. For more information, call 617-437-3327.

College of Engineering

Offers five-year, cooperative education programs in chemical, civil, electrical (including a power systems option and a computer engineering option), industrial, and mechanical engineering leading to the Bachelor of Science with specification according to the department. A more general program leading to the Bachelor of Science without specification is also offered. For highly qualified students, the electrical and computer engineering, mechanical engineering, and industrial engineering and information systems departments offer five-year programs leading to the bachelor's and the master's degree; students carry course overloads beginning in the third year. The College also offers a six-year, part-time evening program leading to the Bachelor of Science degree in civil, electrical, or mechanical engineering. For more information, call 617-437-2154.

College of Nursing

Offers a five-year, cooperative education program leading to the Bachelor of Science in Nursing. The program is accredited by the National League for Nursing. For more information, call 617-437-3102.

College of Pharmacy and Allied Health Professions

Offers five-year, cooperative education programs leading to the Bachelor of Science in Pharmacy, Respiratory Therapy, and Toxicology, and to the Bachelor of Science with specification in medical laboratory science and health record administration. Associate's degree programs are offered in medical laboratory science, respiratory therapy, and dental hygiene. The College also offers post-baccalaureate certificate programs for physicians' assistants, health record administrators, and respiratory therapists. For more information, call 617-437-3321.

School of Engineering Technology

School of Engineering Technology, a division of the College of Engineering, offers engineering technology programs leading to the Associate in Engineering, Associate in Science, and Bachelor of Engineering Technology degrees. Programs include a full-time, day curriculum on the cooperative plan leading to the Bachelor of Engineering Technology in mechanical and electrical engineering technology, and in computer technology and aerospace maintenance engineering technology. The School also offers a part-time, evening program leading to the Associate in Engineering and the Bachelor of Engineering Technology in civil, mechanical, and electrical engineering technology; computer technology; and aerospace maintenance engineering technology. The Associate in Science degree may be earned in telecommunications and energy systems. For more information, call 617-437-2500.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time day and evening programs in business administration, health professions and sciences, law enforcement, and liberal arts leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. A number of certificate programs are also available. For more information, call 617-437-2400.

Graduate Schools

Boston-Bouvé College of Human Development Professions

Offers full- and part-time programs leading to the Master of Science degree with specialization in counseling psychology, physical education, physical therapy, recreation management, and speech-language pathology and audiology.

The Master of Education degree may be earned with specialization in counseling, consulting teacher of reading, curriculum and instruction, educational research, human development, rehabilitation, and special education. The Doctor of Education degree may be earned in leadership: administration and supervision, with specialization in counseling, educational administration, or rehabilitation administration. For more information, call 617-437-2708.

College of Arts and Sciences

Offers programs leading to the Master of Arts degree in economics, English, history, journalism, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology; chemistry; economic policy and planning; law, policy, and society; mathematics; and physics. The Master of Technical and Professional Writing, the Master of Science in Health Science, the Master of Journalism in News Media Management, and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Certificate of Advanced Graduate Study in advanced literary study and to the Doctor of Philosophy degree in biology; chemistry; economics; law, policy, and society; mathematics; physics; psychology; and sociology. There are also certificate programs in economics of manpower and development planning and in technical writing. Most programs may be completed through either full- or part-time study. For more information, call 617-437-3980.

College of Business Administration

Offers five programs leading to the Master of Business Administration (M.B.A.) degree. Options include a cooperative education M.B.A. program, a full-time M.B.A. program, and a part-time M.B.A. program. An executive M.B.A. program

tailored to the needs of experienced managers and a high-technology M.B.A. program designed for professionals in the high-technology community are offered on a part-time basis. A non-degree program leading to the Certificate of Advanced Study is also available. For more information, call 617-437-2714.

The Graduate School of Professional Accounting offers a full-time program leading to the Master of Science degree. For more information, call 617-437-3244.

The Center for Management Development offers a variety of nondegree programs and workshops at the graduate level, including the Management Development Program, the Management Workshop 1 and 2, the Management Workshop in High Technology, and the Smaller Business Executive Program. Call 617-437-3272 for more information.

College of Computer Science

Offers full- and part-time programs leading to the Master of Science in Computer Sciences. Programs concentrate on artificial intelligence, communications and networks, data bases, interactive systems design, systems software, and theory. For more information, call 617-437-2462.

College of Criminal Justice

Offers both full- and part-time programs leading to the Master of Science in Criminal Justice. Criminal justice students may concentrate in administration and planning, criminology and research, or security administration, or they may develop their own multidisciplinary concentration under the supervision of a faculty advisor. For more information, call 617-437-3327.

College of Engineering

Offers programs leading to the Master of Science with specification in chemical, civil, industrial, and mechanical engineering; electrical and computer systems engineering; information systems; and transportation. A five-year program leading to both a bachelor's and a master's degree is offered in electrical, industrial, and mechanical engineering and a six-year program leading to both a bachelor's and a master's degree is offered in power systems. Professional Engineer's degrees are offered in electrical, industrial, and mechanical engineering. The Doctor

of Philosophy degree is offered in chemical, civil, electrical, and mechanical engineering and in industrial engineering and information systems. A Doctor of Engineering is offered in chemical engineering. A Women in Engineering and a Women in Information Systems program are also available. For more information, call 617-437-2711.

College of Pharmacy and Allied Health Professions

Offers programs leading to the Master of Science degree in biomedical science, clinical chemistry, hospital pharmacy, medical laboratory science, medicinal chemistry, and pharmacology. The Master of Health Professions is offered with options in general, health policy, physician assistant, and regulatory toxicology. A doctorate degree program is offered in biomedical science with specialization in medical laboratory science, medicinal chemistry, pharmaceutical sciences, pharmacology, or toxicology. A graduate program in clinical pharmacy, leading to the Doctor of Pharmacy is also available. For more information, call 617-437-3211.

School of Law

Offers a full-time day program leading to the Juris Doctor degree. The three-year curriculum includes four quarters of experience in judges' chambers, law offices, or governmental agencies, or with other law practitioners. For more information, call 617-437-2395.

Center for Continuing Education

The Center for Continuing Education was established to connect the University with the educational needs of the community. The Center offers a wide range of workshops, conferences, seminars, forums, and special training programs in such areas as business, building technology, emergency medical training, graphic arts, health, management, nursing, paralegal studies, and test preparation courses for the SAT, GMAT, LSAT, and GRE examinations. For more information, write or call the Northeastern University Center for Continuing Education, 370 Common Street, Dedham, MA 02026, telephone 617-329-8000.

Insurance and Financial Services Institute

The Insurance and Financial Services Institute was established to foster excellence in the insurance and financial services communities in the Boston area. It offers a number of courses in preparation for the chartered life underwriter and chartered property-casualty underwriter designations as well as programs in general insurance, risk management, insurance licensing, and NASD Series 7 and 63. The Institute also offers a number of seminars designed to address timely issues in both the insurance and the financial services professions. For more information, call or write the Northeastern University Insurance and Financial Services Institute, 89 Main Street, Suite 203, Medway, MA 02053, telephone 617-533-5101.

Research

Research, whether performed in the laboratory, in the library, or in the field, is vital to the University's operation. It stimulates all participants and ensures a thriving academic atmosphere. Through research, faculty members and students stay abreast of the most recent developments in their particular fields. Faculty who disseminate this knowledge through publishing, speaking, and teaching help ensure a university education of the first order.

At Northeastern University, research and scholarly endeavors are taken very seriously and are actively encouraged. Each year the faculty receive funding for an ever-increasing number of research projects. Sponsorship comes from a variety of sources. Federal agencies, private industry and foundations, and the University itself all contribute to Northeastern's growing research emphasis.

Although much of this research is carried out by faculty members, their graduate students, and post-doctoral research associates, ample opportunities exist for undergraduate students. Research participation can take place as part of regular academic programs, as specially designed independent studies, or through cooperative

work assignments. Research activities are encouraged and are limited only by the student's own motivation and curiosity.

Northeastern University has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institute of Health Research Awards. Faculty members lecture the world over—from just across the Charles River in Cambridge to clear across the Pacific Ocean in Sydney, Australia.

In addition, many faculty serve as United States government consultants and participate on a variety of national and international committees. But because Northeastern considers education its primary mission, students will always find an enthusiastic and accessible faculty to answer questions, solve problems, and stimulate inquiring minds.

Current research spans almost every academic and professional field and is not limited to laboratory investigations or the "hard" sciences. Every department of every college at Northeastern carries out some basic or applied research projects.

Facilities and Resources

In 1910, Northeastern University began construction on the first piece of land acquired at its present Huntington Avenue site. Since those early days, the central Boston campus has grown to occupy over 50 acres of land located close to such cultural landmarks as Symphony Hall, the Museum of Fine Arts, the Isabella Stewart Gardner Museum, Horticultural Hall, and the Boston Public Library. The University is within walking distance of Fenway Park, Copley Place, the Back Bay shopping district, and a number of renowned hospitals, including Brigham and Womens and Harvard teaching hospitals.

In addition to five suburban campuses, a number of branch locations, and several off-campus athletic facilities, Northeastern University maintains a variety of affiliations that provide its students access to facilities and specialized equipment at other institutions and organizations.

The main Boston campus is built around a quadrangle, one side of which faces Huntington Avenue, a major artery dividing the campus. The buildings surrounding the quadrangle characterize the urban design of the campus and the innovative design of the new buildings that have been added in recent years has maintained an architectural theme that is both attractive and functional.

The campus itself has been planned to provide easy access to classrooms, laboratories, and administrative offices through a series of connected walkways and a network of underground corridors providing routes that are especially convenient during periods of inclement weather. As the University continues to expand, parking and recreational areas are integrated into the campus along with new academic facilities.

Suburban Facilities

Northeastern University's five suburban campuses provide administrative and classroom facilities for the University's graduate, adult, and continuing education programs, as well as the environment necessary for specific programs of study that could not be accommodated in an urban area.

The Warren Center provides a practical laboratory in outdoor education and conservation and in camping administration, programming, and counseling. It also offers a summer campsite for various community and University groups and activities and is available as a conference and workshop site.

The Marine Science and Maritime Studies Center is located in Nahant, on Massachusetts Bay, 20 miles northeast of Boston and serves as a site for national, international, and University research.

Henderson House is Northeastern University's conference center. Located 12 miles from Boston in suburban Weston, Henderson House hosts a variety of round-the-clock activities including residential seminars, workshops, short courses, and weekend meetings.

The Suburban Campus of Northeastern University is located in Burlington, near the junction of Routes 128 and 3. Full-time courses for freshmen and alternative freshmen are offered here as well as part-time, undergraduate courses in a variety of subject areas and part-time, graduate courses in engineering and business administration. The Burlington campus also offers special programs for adults and noncredit continuing education courses.

The Suburban Campus is situated close at hand to another Northeastern University facility, the Botanical Research Station in Woburn, which contains a small arboretum and a spacious greenhouse for propagation and research.

One of the most recent campus acquisitions is the 20-acre Dedham Campus, just north of Route 128. This facility houses the Center for Continuing Education and provides space for the College of Business Administration's High Technology M.B.A. program.

University Libraries

The University Libraries include seven units. On the Boston campus, there is the main facility, Dodge, and three libraries that house graduate-level collections in chemical and biomedical sciences, mathematics and psychology, and physics and electrical engineering. There are also libraries located on the Burlington and Dedham campuses and at the Marine Science and Maritime Studies Center in Nahant.

The total holdings of the University libraries include the equivalent of more than one million volumes in print and in microform; 5,000 periodical titles; 300,000 government documents; and 24,000 items in audio-visual and computer software formats.

In the main library, the Learning Resources Center provides computer-assisted instruction, microcomputer facilities, and language and music listening laboratories. Also housed in the Center is an extensive set of self-paced media materials in various interactive formats, including audiotapes, videotapes, and computer-assisted lessons and exercises.

The University's membership in the Boston Library Consortium generally allows Northeastern University students on-site use of consortium libraries at the following institutions: Boston College, Boston Public Library, Boston University, Brandeis University, Massachusetts Institute of Technology, State Library of Massachusetts, Tufts University, the University of Massachusetts (Amherst, Boston, and Worcester campuses), and Wellesley College. Borrowing privileges may also be granted to graduate students who hold a consortium card.

Academic Computer Services

Academic Computer Services supports research activities of faculty, research personnel, and graduate students, as well as teaching and learning activities at both the graduate and undergraduate levels. The computational capability of this facility includes 115 IBM personal computers linked in local-area networks at the Boston, Burlington, and Dedham campuses. A wide-area network also provides students and faculty with time-sharing access to five large computers through video and hard-copy terminals arranged in clusters at all three campuses. The wide-area network connects three Digital Equipment Cor-

poration VAX-11/780 systems plus an additional VAX 11/785 and a Data General MV/8000. This network also provides access through a number of dial-in telephone lines, primarily for faculty use, to all five computers. A variety of graphics and output devices are also available. Effective use of all facilities is promoted by the availability of programming assistance at all three campuses.

Electronic spreadsheet and word-processing packages are available, as well as numerous software libraries for numerical, statistical, and financial applications. The primary languages supported are FORTRAN, COBOL, BASIC, PASCAL, LISP, PL/I, and Assembler.

Department of Career Development and Placement

The Department of Career Development and Placement offers a wide range of counseling and placement assistance to all seniors, graduate students, and alumni of Northeastern University seeking employment, as well as to students interested in participating in nonpaid, part-time internships in private or public nonprofit agencies for which they may receive academic credit.

Through this department, representatives of hundreds of employers are scheduled to visit the campus each year to interview seniors and graduate students for full-time employment after graduation. A job bank of currently available positions is maintained for alumni who are seeking new opportunities. Credential service is provided for students and alumni seeking positions in the field of education and for applicants for graduate and professional schools. Regularly scheduled seminars are conducted for seniors, graduate students, and alumni on career development, job-finding techniques, résumé preparation, and effective interviewing. Individual career counseling is available for seniors, graduate students, and alumni of all University programs.

Sport, Dance, and Exercise Facilities

Through its Cabot Center for Physical Education, Dockser Hall, and Barletta Natatorium, Northeastern University offers a wide variety of specialized facilities, including basketball courts, dance studio, indoor athletic field and running track, gymnastics room, combatives room, weight-training rooms, swimming pool, crew

practice tank, racquetball courts, and motor performance and exercise physiology laboratories. The Matthews Arena, with seating for more than 5,000 fans, provides home ice to the University's varsity and subvarsity hockey teams and, when the portable playing floor is down on the ice, home court to the University's basketball teams.

For organized athletics requiring facilities not available on the main campus, Northeastern maintains several off-campus locations, including the Northeastern Boat House, which is located on Memorial Drive in Cambridge and provides a home for the University's crew teams. The Edward S. Parsons Field, on Kent Street in Brookline, is the playing ground for the football, baseball, women's lacrosse and women's field hockey teams, and some intramurals.

Dedham Track

A recently completed outdoor track and field facility in Dedham has an eight-lane, Action Trak 200 running surface and an expansive area for concurrent jumping and field events. This new facility is ready to host dual and championship meet competition and is a permanent site for Northeastern University track athletes.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, a cafeteria with seating for more than 1,000, and a bookstore.

Lane Health Center

A comprehensive program of medical care is provided to all full-time graduate and undergraduate students. The University maintains a health services clinic, which is open for emergencies at all times and is equipped to deal promptly with any medical condition that may arise. All entering full-time students must submit a pre-entrance physical examination form provided by the Lane Health Center prior to registration. Failure to fulfill this requirement can delay registration and result in a penalty fee and an additional fee for a physical examination.

Counseling and Testing Center

Counseling and testing to aid a student or prospective student with career, educational, or personal concerns are available days and certain weekday evenings until 8:30 p.m. Information and appointments can be obtained by calling 617-437-2142 or by visiting the Counseling and Testing Center.

Office of Services for the Handicapped

Any student who has a disability-related special need, no matter how small or individual, can receive ready support services from the Office of Services for the Handicapped (OSH). Frequently, students are uncertain about how they may be aided by this office, and in these situations a discussion of possible alternatives can be quite helpful. OSH provides a wide range of support services to eliminate the competitive disadvantages that a disability may create. Services are individually tailored to meet the needs of each student.

The types of assistance available from the Office include orientation, registration and preregistration, an information clearinghouse, counseling, housing, services for the hearing-impaired, the wheelchair user/mobility-impaired, and learning-disabled student.

The Office is also the gathering place for the Disabled Student Organization of Northeastern University, which works cooperatively with OSH to plan programs and improve accessibility of services for the handicapped persons at Northeastern.

Office of Multicultural Student Affairs

The Office of Multicultural Student Affairs was created for the purpose of meeting the needs of Third World students. The Office oversees the coordination and implementation of support services provided by the English Language Center and the International Student Office. Moreover, the Office provides advocacy representation at the upper level of University administration, thereby insuring that Third World student needs are being comprehensively addressed.

Network Northeastern University

Network Northeastern University (NNU) represents the University's entry into the age of education by telecommunications. The Network uses the microwave-based Instructional Television Fixed Service (ITFS) system whereby educational services are delivered directly to company sites and other remote locations within a 30-mile radius of Northeastern's main Boston campus. With this service, live classroom instruction is telecast in color to remote sites, where it is viewed in reception rooms equipped with television monitors and a telephone-based talkback system. During presentations, off-campus students are able to participate in the instruction as fully as the students on campus. A courier service collects and delivers homework assignments and serves as the off-campus student's link to the bookstore, registrar, and other campus services.

Network Northeastern currently offers courses in graduate engineering, undergraduate engineering technology, and selected arts and sciences topics. This instruction is telecast daily between 8 a.m. and 10 p.m. on four channels to off-campus students at 15 company sites and two suburban campuses.

Faculty

Samy A. Abdel-Baky, Ph.D.

Chemistry
Northeastern University

Herbert Abrams, M.L.*

Law Enforcement
Superior Court of Massachusetts

Michael J. Abruzzese, M.B.A.

Information Systems
U. Mass. Medical Center

Deborah A. Adair, M.S.

Health Record Administration

Henry Adleman, B.S.*

Information Systems
Digital Equipment Corp.

John M. Aflague, R.N., B.S.

Health Science
Massachusetts General Hospital

Paul D. Ahern, M.B.A.

Accounting
Carter Company

Thomas J. Ahern, Jr., J.D.*

Business Law
Silver and Ahern

H. David Ahlberg, Ph.D.*

Biology
American International College

Joseph Aieta III, M.A.*

History
Lasell Junior College

Fariba Aliloo, M.S.

Information Systems
Northeastern University

Kariman I. Allam, B.S.

Chemistry
Northeastern University

Mary T. Allard, B.S.

Medical Laboratory Science
Children's Hospital

Israel Aluf, Ph.D.*

Modern Language
Northeastern University

Harold E. Ameral, B.S.

Law Enforcement
Massachusetts State Police

Richard J. Amorosi, B.F.A.

English
Cardinal Spellman High School

Craig A. Andersen, B.S.

American Sign Language
Northeastern University

Paul G. Anderson, B.S.*

Art
Artist

R. Wayne Anderson, Ph.D.*

History
Northeastern University

Linda A. Andros, J.D.

Real Estate
Attorney General's Office

Joseph F. Angeramo, Esq., LL.B.*

Finance

Robert B. Angus, M.S.

Management Sciences
ANAB Associates

Stanley S. Antoniotti, M.A.*

Economics
Bridgewater State College

Robert F. Anzenberger, B.S.

Human Resources Management

Robert J. Anzenberger, M.A.

Human Resources Management
Zayre Corp.

Joan L. Arches, M.S.*

Sociology/Anthropology
Regis College

Joseph T. Arcidiacono, B.S.

Information Systems
Digital Equipment Corp.

Edward A. Arees, Ph.D.

Psychology
Northeastern University

Stephen F. Armstrong, Sr., M.B.A.*

Purchasing
Varian Associates

Jane Aroian, M.S.

Nursing
Northeastern University

Steven A. Aronson, B.S.

Information Systems
The Gillette Company

Pamela J. Aselton, M.S.

Health Science
Boston University

Meredith O. Atkinson, M.A.

English

David J. P. Aurelio, HS.D.

Radiologic Technology
St. Luke's Hospital

Saul H. Auslander, M.B.A.

Finance
Bridgewater State College

Alice D. Avakian, M.S.

Biology
Emerson College

Jason M. Avergun, M.B.A.*

Marketing
York International Corp.

Warren F. Averill, M.S.*

Chemistry
Milton School Department

Nawal Awad, M.A.

Alt. Freshman/Mathematics

Paula L. Aymer, M.A.

Sociology/Anthropology
Northeastern University

Virginia Ayoob, M.A.

Music

David R. Ayotte, M.Ph.

Medical Laboratory Science
Fenway Community Health Ctr.

David L. Bachrach, Ed.D.*

Psychology
Boston VA Medical Center

Philip N. Backstrom, Ph.D.

History
Northeastern University

Swaminathan Badrinath, D.B.A.

Finance
Northeastern University

Anthony J. Bajdek, M.A.*

History
Northeastern University

Edward F. Baker, M.S.

Mathematics
Westwood High School

Errol H. Baker, Ph.D.*

Psychology
Boston VA Medical Center

Ramaiya Balachandra, D.B.A.

Management
Northeastern University

James C. Baldwin, B.F.A.

Art

Dorothy J. Bales, M.A.

Music
N.E. Conservatory of Music

Peter S. Baletsa, M.S.

Biology
Lynn Public School System

George B. Ballester, M.A.

Information Systems
Pegasystems, Inc.

Kenneth W. Ballou, M.A.

Management
Waters Business Systems, Inc.

David M. Banash, J.D.

Business Law
Self-Employed

Louis E. Banderet, Ph.D.*

Psychology
U.S. Army Research Institute

John J. Baranofsky, M.S.*

Management
Raytheon Company

Antonio Barbagallo, M.A.

Modern Language
Salem High School

Didier Bardon, B.S.

Art
Self-Employed

David R. Barkmeier, Ph.D.

Psychology
Northeastern University

Raymond S. Barnstone, M.B.A.*

Finance
Codex Corp.

Barbara R. Barry, Ph.D.

Music
N.E. Conservatory of Music

Scott P. Bartis, Ph.D.

Psychology
Lighthouse School

Bernard N. Basch, M.B.A.*

Information Systems
F. W. Faxon Co., Inc.

Norman D. Bates, J.D.*

Law Enforcement
Northeastern University

William W. Bauser, M.A.

Philosophy/Religion

Anthony Beadle, B.A.

Music

*Denotes senior lecturer as of October 1985.

Marcus A. Bearse, Jr., M.A.

Psychology
Northeastern University

Alan J. Beauchamp, M.B.A.

Accounting
Wang Laboratories, Inc.

Paul Beaulieu, Jr., A.S.

Radiologic Technology
Massachusetts General Hospital

Gail M. Becker, A.S.

Health Record Administration
Boston Univ. Medical Center

Nancy V. Becker, M.Ed.

American Sign Language
Northeastern University

Judith E. Bedford, M.A.

Music

Stanley A. Beecoff, M.B.A.*

Management
General Connector Corp.

Roger Beer, M.S.

Information Systems
Digital Equipment Corp.

Richard E. Belanger, B.S.*

Management
Honeywell, Inc.

Cynthia H. Belhumeur, B.S.

Therapeutic Recreation
Athlete's Corner

Russell Beliveau, M.B.A.

Information Systems
Self-Employed

Diane M. Bellavance, C.A.G.S.

Marketing
D. Bellavance, Agency

Barbara A. Belmont, B.A.

Psychology
Northeastern University

Ralph C. Belmonte, Ed.D.*

Speech Communication
Revere Public Schools

Barbara A. Beltrand, M.A.

Accounting
Fenway Community Health Center

Patricia Bench, M.Ed.

Alt. Freshman/Mathematics

David A. Bender, B.S.

Information Systems

General Data Corp.

Richard F. Benedetto, M.A.

Management

Merrimack College

Claire T. Bennett, M.S.

Health Management

Jordan Hospital

Paula Bennett, Ph.D.*

English

Maria F. Benotti, M.A.

Music
N.E. Conservatory Extension

Paul J. Bento, M.S.

Earth Science
J. P. Keefe Technical School

Marcia Berhman, M.Ed.

Alt. Freshman/Language Skills

Ann K. Berliner, B.A.

Alt. Freshman/Language Skills
Northeastern University

Benjamin A. Berman, B.A.

Transportation
Benjamin A. Berman Assoc.

Mark S. Berman, M.Ed.

Health Management

Samuel J. Bernstein, Ph.D.*

English
Northeastern University

Henry M. J. Biagi, M.A.

Hotel & Restaurant Management
City of Somerville

Maryann G. Billington, M.B.A.

Marketing
Northeastern University

Peter J. Billington, D.B.A.

Management
Northeastern University

Bonnie Bishop, M.Ed.

Alt. Freshman/English

Samuel S. Bishop, M.F.A.*

Art
Northeastern University

Susan Bjorner, M.L.S.

Library Science
Massachusetts Institute of Technology

Al Black, M.B.A.

Accounting

Charles K. Black, M.B.A.

Accounting
Lewcott Chemical & Plastics Corp.

Carl Blackman, B.S.*

Accounting
Carl Blackman & Co.

Eugene J. Blackman, M.A.*

Drama
Northeastern University

Charmarie J. Blaisdell, Ph.D.*

History
Northeastern University

Robert J. Blanch, Ph.D.*

English
Northeastern University

Dennis Blanchard, M.B.A.

Information Systems
Hills Department Stores

Thomas W. Blaney, M.S.

Information Systems
Reading High School

Theodore Blank, Ed.D.*

Health Science
Mass. Dept. of Public Health

Carolyn L. Blich, M.A.*

Sociology/Anthropology
Northeastern University

Stanley I. Bogdan, B.S.*

Law Enforcement
Boston Police Department

Habib Borjian, M.S.

Mathematics

Vincent C. Borman, M.B.A.*

Transportation
Raytheon Company

Lorraine M. Bossi, M.S.

Nursing
Children's Hospital

Charles R. Botticelli, Ph.D.

Biology
GTE Laboratories

Guy E. Bottiglio, M.S.

Information Systems
Digital Equipment Corp.

Mark S. Bourbeau, J.D.

Real Estate
Commonwealth of Massachusetts

Theodore R. Bousquet, B.S.*

Information Systems
Honeywell, Inc.

John F. Bowes, Jr., M.B.A.*

Information Systems

Human Resources Management
Dept. of Health and Human Services

Patricia E. Boyce, Ph.D.

Sociology/Anthropology
Northeastern University

Richard W. Boyden, B.S.

Information Systems
Chess King

Catherine M. Boyle, M.Ph.

Health Management
Massachusetts General Hospital

Alan Bradshaw, M.S.*

Mathematics
Chelmsford School Department

Patrick J. Brady, B.S.

Law Enforcement
Boston Police Department

Thomas P. Brady, Jr., M.B.A.

Accounting
Rowe & Brady

Russell S. Braese, B.S.

Real Estate
NYNEX Properties Corp.

Eugene G. Branca, M.S.*

Mathematics

Barbara R. Brathwaite, M.Ed.

Human Resources Management
Automatic Data Processing

Joseph A. Brazaszkas, M.S.

Earth Science
J. P. Keefe Technical School

Raymond W. Brennan, M.S.*

Law Enforcement
Mass. Correctional Institution

David L. Brett, M.S.

Information Systems
Reading Memorial High School

Caroline B. Bridgeman-Rees, M.A.

History
International Institute

Edward J. Brigman, M.A.

Economics

Barbara K. Britt, B.A.

Human Resources Management
Britt Associates, Inc.

John E. Brodeur, M.P.A.

Journalism

David L. Brody, B.S.*

Law Enforcement
Boston Police Department

George M. Brooker, M.B.A.*

Economics
Dean Junior College

Miriam G. Brooks, M.A.

Art
Waterline Publications

*Denotes senior lecturer as of October 1985.

Ernest D. Brown, Ph.D.

Music
Northeastern University

Fern M. Brown, M.Ed.

English

Gerald R. Brown, M.S.*

Law Enforcement
Plymouth Superior Court

Ann S. Broyer, B.A.

Women's Career Program
N. S. Stone, Inc.

Gordon L. Brumm, Ph.D.*

Philosophy/Religion

Richard P. Bucci, M.B.A.

Accounting
Self-Employed

Eugene E. Bucco, M.B.A.

Accounting
Unico Service Company

Harold G. Buchbinder, M.S.M.E.

Journalism

Leo F. Buckley, Jr., M.B.A.

Accounting
Wang Laboratories

Michael L. Buckley, M.B.A.

Accounting
Beth Israel Hospital

Anthony A. Buglio, M.S.*

Speech Communication

Kenneth R. Buja, B.S.

Transportation
Associated Air Freight

Richard H. Bullock, Ph.D.

English
Northeastern University

Bruce Buntin, B.S.*

Human Resources Management
Human Resource Services

Edward L. Burke, J.D.*

Transportation
Commonwealth of Massachusetts

Robert K. Burke, M.B.A.

Information Systems
Commercial Union Ins. Co.

Alfred C. Burmeister, M.B.A.*

Information Systems
Digital Equipment Corp.

Gerald L. Bursey, Ph.D.

Political Science

Charles F. Burt, M.B.A.*

Accounting
H. J. Stabile & Son, Inc.

Rev. Richard W. Burton, B.S.*

Earth Science

Karen Buzzard, Ph.D.

Speech Communication

Ronald J. Byrnes, M.B.A.*

Management Sciences
CIBA Corning Diagnostics

Robert T. Cadigan, Ph.D.

Health Management
Dept. of Public Health

Susan M. Caldarella, M.A.

Psychology
Northeastern University

Linda B. Caliga, M.B.A.

Women's Career Program
Cardinal Cushing Hospital

William A. Calore, B.S.

Hotel & Restaurant Management
Rindge Latin School

Charles Calusdian, M.B.A.*

Industrial Management
Raytheon Company

David S. Calverley, Ph.D.*

Psychology

Ballard C. Campbell, Ph.D.

History
Northeastern University

Dana B. Campbell, M.B.A.

Accounting
Digital Equipment Corp.

Susan C. Campbell, M.Ed.

English
Mosaic Software

James A. Canino, M.A.

Sociology/Anthropology
N. Essex Community College

Mira Cantor, M.F.A.

Art
Northeastern University

Edgar D. Canty, M.S.*

Mathematics
Bridgewater State College

Enrico C. Cappucci, B.S.

Law Enforcement
Shirley Police Department

Donald A. Carbone, M.Ed.

Accounting
Boston Regional Ed. Center

Anthony M. Carilli, A.B.

Economics
Self-Employed

Olga F. Carito, M.S.

Mathematics
Watertown High School

Rebecca E. Carosso, M.Ed.

Speech Communication
Chelmsford High School

Charles J. Carr, M.B.A.*

Accounting
The New Can Co., Inc.

Janet H. Carr, M.A.

English
Northeastern University

John M. Carr, B.S.

Earth Science
Museum of Science

William F. Carr, LL.B.

Business Law
Puopolo & Carr, P.C.

Patrick R. Carroll, Esq., J.D.*

Health Management
Massachusetts Hospital Association

William S. Carroll, Esq., J.D.

Health Management
Brigham & Women's Hospital

Norman J. Cartmill, M.B.A.*

Management
Carnor Management Systems

Arthur F. Casavant, M.B.A.

Purchasing
Raytheon Company

Patricia M. Casey

Accounting
PMC Consulting Services

Robert W. Casey, M.Ed.

Speech Communication
Burlington High School

Margaret P. Casper, Ph.D.

Mathematics
King Philip Regional Schools

Christopher L. Cass, M.A.

Sociology/Anthropology
Badger Engineers, Inc.

Sharron G. Cassavant, Ph.D.

English
Simmons College

Christopher J. Cassidy, M.S.*

Information Systems
Northeastern University

Richard Castle-Walsh, M.B.A.

Women's Career Program
Bethlehem Steel Corp.

Miriam Castro-Feliciano, M.S.

Biology

Karen A. Chagnon

Health Science
Newton-Wellesley Hospital

George Y. Chao, M.D.

Health Science

Michael D. Chefitz

Business Law
Johnson & Polubinski

Kenneth Chernack, M.B.A.

Information Systems
Digital Equipment Corp.

Joseph W. Chevarley, Jr., D.B.A.

Management
Northeastern University

Catherine Chiang, M.A.

Economics
Northeastern University

John T. Chirban, Ph.D.

Psychology
Harvard Univ. & Hellenic Coll.

John A. Chmielinski, M.Ed.*

Law Enforcement
Mass. Dept. of Corrections

Catherine A. Chokola, M.F.A.

Art

John A. Christoforo, Jr., M.B.A.

Health Management
Lawrence Memorial Hospital

Curtis C. Chui, M.D.

Health Science
Care One Doctors

Warren W. Church, M.S.

Radiologic Technology
Boston Regional Office

Anthony Cicerone, M.A.

Economics

Joseph D. Clancy, J.D.

Law Enforcement
District Court of Natick

David E. Clapp, M.Ed.

Biology
Massachusetts Audubon Society

Geoffrey Clarkson, D.B.A.

Management
Northeastern University

Fred W. Clarridge, Jr., M.S.

Earth Science

Howard S. Clayman, B.A.

Information Systems
Dynamics Research Corp.

*Denotes senior lecturer as of October 1985.

- Richard W. Clayton, Jr., M.Ed.**
English
Dover Regional High School
- Paul F. Cleary, M.A.**
Economics
Occupational Analysis
- Carol Ann Clem, M.B.A.**
Marketing
- Paul Clemente, Jr., M.S.**
Accounting
Boston University
- Patricia A. Cloonan, M.S.**
Nursing
Northeastern University
- William M. Cloran, J.D.***
Law Enforcement
DiCara Selig & Holt
- Yvonne M. Cobbige, M.A.**
Music
Self-Employed
- Sharlene V. Cochrane, Ph.D.**
History
Boston College
- Gerald F. Cody, B.A.**
Marketing
Dean Witter Reynolds, Inc.
- Mary C. Cody, B.S.**
American Sign Language
Northeastern University
- Cathy Cogen, M.Ed.**
American Sign Language
Northeastern University
- William G. Coggan, Ph.D.***
Human Resources Management
Massasoit Community College
- Edward S. Cohen, M.A.***
Information Systems
Hampden Automotive Sales
- Richard A. Cohen, B.S.**
Real Estate
City of Boston
- Robert F. Cohen, B.S.**
Accounting
Self-Employed
- Robert L. Cohen, M.S.**
Information Systems
- Jaimee W. Colbert, M.A.**
English
- Stephen F. Coleman, M.S.**
Political Science
Northeastern University
- Annalee Collins, R.R.A., B.S.***
Health Record Administration
Northeastern University
- Eleanor Collins, M.S.**
Alt. Freshman/Mathematics
- Richard J. Comings, M.A.***
History
Northeastern University
- John J. Condon, Jr., M.B.A.**
Accounting
Avco Systems Division
- Paul C. Condon, M.B.A.**
Marketing
Xyplex Inc.
- Elizabeth M. Congdon, M.A.***
History
Peabody School System
- Spencer F. Conley, B.S.**
Journalism
Spencer F. Conley Associates
- Leonard M. Conlin, Sr., M.Ed.***
Mathematics
Framingham North High School
- John F. Connelly, Ph.D.**
Information Systems
Boston Edison Company
- John J. Connelly, B.S.**
Law Enforcement
Mass. Trial Court, Norfolk
- William G. Connelly, B.S.**
Law Enforcement
- Thomas F. Connerty, M.B.A.**
Information Systems
Prime Computer, Inc.
- James J. Connolly, M.B.A.**
Accounting
Natick Public Schools
- Joseph N. Connors, M.P.A.***
Political Science
Liberty Security
- Linda W. Conrad, J.D.**
Journalism
Moquin & Daley
- Louis E. Conrad, M.S.**
Journalism
Northeastern University
- Peter Contis, M.B.A.**
Accounting
Northeastern University
- Lindsay Cook, M.S.**
Accounting
Liberty Financial Services
- Ellen M. Cooney, M.A.**
English
Self-Employed
- Ronald M. Copeland, D.B.A.**
Accounting
Northeastern University
- John S. Corcoran, M.S.**
Technical Communications
- Norma Corey, E.D.**
Alt. Freshman/Language Skills
- Dyer Cornell, M.B.A.***
Finance
First National Bank
- Richard S. Corrente, M.B.A.***
Management
Raytheon Company
- Edward V. Cosgrove, Ph.D.***
Biology
Commonwealth of Massachusetts
- William H. Costello, Ph.D.**
Psychology
Self-Employed
- James W. Cottom, M.A.**
History
Massasoit Community College
- Jonathan C. Covell, B.A.**
Information Systems
Hills Department Stores
- Thomas F. Coveney, M.B.A.***
Information Systems
Stone & Webster Eng. Corp.
- James M. Cox, M.Ed.***
Law Enforcement
Boston Police Department
- Wallace Coyle, Ph.D.**
English
University of Massachusetts
- Carol L. Crane, M.S.**
Women's Career Program
Mass. Higher Ed. Asst. Corp.
- Bryan D. Craven, B.S.**
Information Systems
General Electronics Company
- Kathleen Crimmins, M.A.**
Technical Communications
Codex Corp.
- Salvatore A. Crisafulli, M.B.A.***
Information Systems
Fleet Financial Group
- Robert D. Crofts, M.A.***
Economics
Salem State College
- John F. Cronin, Jr., M.B.A.***
Accounting
Raytheon Company
- Joseph V. Cronin, Jr., J.D.***
Business Law
Massachusetts Trial Court
- Joseph W. Cronin, B.S.***
Management Sciences
Sanders Associates
- Hugh J. Crossland, D.B.A.**
Accounting
Weston Financial Group
- Brian C. Crowley, M.B.A.***
Accounting
The Flatley Company
- Dennis M. Crowley, Jr., J.D.***
Law Enforcement
First Security Services
- Mark D. Crowley, M.B.A.**
Accounting
Autex Systems, Inc.
- Patricia L. Culbert, M.F.A.**
Drama
Brimmer and May School
- John F. Cullen, J.D.***
Law Enforcement
Attorney at Law
- Joseph I. Cullen, M.Ed.**
Law Enforcement
Commonwealth of Massachusetts
- David M. Culver, Ph.D.***
History
Bridgewater State College
- Edmund Cuoco, B.A.**
Technical Communications
Lexicon, Inc.
- Helen M. Curley, M.A.***
Law Enforcement
- Kathleen F. Curley, D.B.A.**
Information Systems
Northeastern University
- Joan Curtice, M.A.**
Human Resources Management
Lionex Corp.
- Robert S. Curtin, Ed.D.**
History
Northeastern University
- John J. Curtis, M.A.**
Music
Emerson College

*Denotes senior lecturer as of October 1985.

Roseann Cutroni, M.S.
Health Science

St. Elizabeth's Hospital

Patricia Dacey, M.Ed.
Women's Career Program
YWCA

Maria N. DaCosta, M.S.
Economics

Northeastern University

Dennis P. Dalton, M.F.A.
Art

Joanne M. Dalton, M.S.
Nursing

Northeastern University

Albert C. D'Amato, M.Ed.*
English

Northeastern University

Miriam F. D'Amato, M.A.*
English
Professional Editorial Services

Ralph A. D'Amelio, B.S.
Information Systems

Wang Laboratories

Maria M. Damiano, HS.D.

Radiologic Technology

Brigham & Women's Hospital

Patricia J. Dapolito, M.S.
Health Science

Commonwealth of Massachusetts

Arnold E. Daum, B.S.*
Marketing

Arnold E. Daum Co.

Gerald L. Davis, Ph.D.
Medical Laboratory Science

Northeastern University

Richard J. Davis, M.A.*
Law Enforcement

Belmont School Department

Robert E. Davis, M.B.A.
Accounting

R.E. Davis and Assoc.

Willie J. Davis, J.D.*
Law Enforcement

Attorney at Law

James D. Dawson, Ph.D.

Alt. Freshman/History

Deborah D. Day-Oliver, B.S.
Health Record Administration

Medical Records Service

Lance M. Dean, M.A.

Alt. Freshman/English

Peter U. Decenzo, B.S.
Mathematics

Ashland High School

Robert P. Defosse, B.A.
Purchasing

Digital Equipment Corp.

Joyce Delorey, M.A.
Alt. Freshman/Mathematics

Northeastern University

Dante J. DeMichaelis, J.D.*
Law Enforcement

Attorney at Law

Robert J. Dennehy, M.B.A.

Accounting

Robert J. Dennehy, C.P.A.

Mabel T. Denunzio, Ed.D.*
Law Enforcement

Arthur J. DePietro, M.S.*
Law Enforcement

Juvenile Court

Paul J. Derby, M.B.A.*
Information Systems

Honeywell, Inc.

Joseph B. DeRoche, M.F.A.*
English

Northeastern University

Stephen R. Derosier, M.B.A.
Management

Northeastern University

Harry G. DeSalvatore, M.S.
Therapeutic Recreation

N.E. Memorial Hospital

Ernest P. Desimone, J.D.

Real Estate

McNamara & Desimone

Debra Desmarais, A.S.
Radiologic Technology

Richard K. Deveney, M.Ed.

Mathematics

Jamaica Plain High School

Richard P. Devine, Ph.D.

Sociology/Anthropology

Insight

James D. Devlin, B.S.

Marketing

Network Research Corp.

Robert De Vries, M.A.

Music

Self-Employed

Emily Dexter, M.A.
American Sign Language

Northeastern University

Brian S. Dextradeur, B.S.*

Management Sciences

Polaroid Corp.

Norma M. Diandrea, B.A.

Radiologic Technology

Arthur F. Diette, Jr., B.S.

Law Enforcement

Lowell Police Department

Jeffery E. di Iuglio, M.A.

English

Curry College

Howard T. Dimmick, M.Ed.*

Earth Science

Town of Stoneham

Ernest S. Dinisco, J.D.

Law Enforcement

U.S. Dept. of Justice

Francis J. di Sabatino, M.A.

Chemistry

Quincy High School

Rosemarie M. Dittmer, M.A.*

English

James E. Doan, Ph.D.

English

Chamberlayne Junior College

Edward Doherty, B.S.*

Law Enforcement

Boston Police Department

Robert A. Dolan, M.Ed.*

Law Enforcement

Research Publishing Co., Inc.

Mark Domaszewicz, M.S.E.E.*

Mathematics

Raytheon Company

Edward M. Donie, M.S.
Information Systems

Data General Corp.

John A. Donovan, M.A.

Law Enforcement

Newton Police Department

Timothy R. Donovan, Ph.D.*

English

Northeastern University

Edward M. Dormady, B.A.

Information Systems

Hills Department Stores

James W. Dottin, Jr., M.B.A.

Information Systems

Prime Computer, Inc.

Nadine V. Dowling, M.B.A.

Human Resources Management

Emerson College

Nancy L. Dowling, M.Ed.

Alt. Freshman/Language Skills

Northeastern University

Rose A. Doyon, M.A.*

English

Lowell Sun Times

Joan F. Drexelius, Ph.D.

Speech Communication

Northeastern University

Claire Driscoll, M.A.

Alt. Freshman/Mathematics

Walter T. Driscoll, Jr., M.P.A.*

Law Enforcement

Scituate Police Department

David C. Dronsick, M.A.*

Earth Science

Commonwealth of Massachusetts

Neil F. Duane, M.S.

Technical Communications

Boston Documentation Design

Edward L. Dube, M.B.A.*

Management

ELD Associates

Catherine Dube-Fortin, B.S.

Technical Communications

Self-Employed

James Ducey, M.B.A.

Accounting

Grossman's, Inc.

Terrance J. Dugan, M.B.A.

Finance

Investors Bank and Trust Co.

Daniel T. Dunn, Jr., D.B.A.

Marketing

Northeastern University

Laura W. Dunn, M.A.

English

Edward A. Duprez, Jr., M.B.A.

Management

Emmanuel College

Douglas F. Durant, M.F.A.

Music

Northeastern University

Stephen Durkin, Esq., J.D.

Business Law

Law Offices of Robert Karns

Paul J. Duval, M.B.A.

Information Systems

Commonwealth of Massachusetts

Barbara Dvorchak, M.S.

Mathematics

Northeastern University

*Denotes senior lecturer as of October 1985.

William C. Dwyer, M.B.A.

Management
Sherwood Lumber Corp.

Richard T. Dyro, Ed.D.
English

Carl W. Eastman, M.A.*

Speech Communication
Northeastern University

William T. Edgett, M.A.*
Human Resources Management
Northeastern University

Maureen L. Edison, M.A.*
English
Self-Employed

John C. Edmunds, D.B.A.
Finance

Northeastern University
Gary A. Edwards, M.B.A.
Accounting
U.S. Dept. of Labor

Michael A. Edwards, Ph.D.
Biology
EKS Center for Mental Retardation

Richard K. Edwards, M.A.
Sociology/Anthropology
Northeastern University

Andrew E. Efstathiou, B.A.
Information Systems
Commonwealth of Massachusetts

Kathryn A. Efstathiou, B.A.
Information Systems

Judith R. Ehlen, M.A.
English

David M. Ehrmann, B.S.
Speech Communication
John Hancock Insurance Co.

James H. Elgin, M.B.A.*
Information Systems
Digital Equipment Corp.

Mohamed El-Sayed, Ph.D.
Chemistry
Northeastern University

Hoda A. El Wakil, B.S.
Chemistry
Northeastern University

Susan J. Engelman, A.S.
Radiologic Technology
University Hospital

John H. Englander, M.B.A.
Purchasing
Hewlett-Packard Corp.

Louis J. Ennis, M.B.A.*
Human Resources Management
Brandeis University

Virginia Eskin, M.A.
Music
Northeastern University

Herbert J. Eskot, Ph.D.*
Economics
Northeastern University

Hassanali Espahbodi, D.B.A.
Management
Northeastern University

Ugo E. Evangelista, M.S.
Mathematics
Revere High School

Richard P. Evans, B.A.
Human Resources Management
Management Collaborative

Anne C. Ewers, M.A.
Music
Self-Employed

Benedetto Fabrizi, Ph.D.*
Modern Language
Northeastern University

Robert M. Fahey, M.Ed.*
Information Systems
Nixdorf Computer Corp.

Michael V. Fair, M.S.W.
Law Enforcement
Mass. Dept. of Correction

Eugene F. Fallon, M.B.A.*
Finance
GenRad, Inc.

Edward J. Falvey, M.B.A.*
Management
Keystone-Massachusetts Group

Ghodratallah Farahani, M.A.
Political Science
Boston University

Daniel M. Fasulo, M.P.A.*
Law Enforcement
Haverhill Police Department

Joseph R. Favaloro, M.B.A.
Finance
Bank of Boston

Irwin Feigelman, B.S.*
Accounting
U.S. Government

David Feinman, M.B.A.
Management Sciences
Independent Consultant

Trudi R. Feinstein, Ph.D.
Psychology
Simmons College

Eileen Feldman, M.A.
English
Self-Employed

Mark Feldman, M.B.A.
Information Systems
The Gillette Company

Elizabeth M. Ferrarini, B.S.
English
Self-Employed

James F. Ferreira, M.B.A.
Information Systems
Technical Aid Corp.

James J. Ferriter, M.B.A.
Health Management
Industrial Medical Center

John M. Ferro, M.S.
Accounting
Nashua Valley Tech. High School

William A. Ferson, M.A.
Economics
U.S. Dept. of Labor

George W. Fiddler III, M.B.A.
Accounting
Textron Corp.

Stephen L. Fielding, M.A.
Sociology/Anthropology
Northeastern University

Barbara Ann P. Filo, Ph.D.*
History
CSA Financial Corp.

William D. Finan, Ed.D.
Mathematics

Charles A. Findley, Ph.D.*
Speech Communication

Francis X. Finigan, M.Ed.*
Mathematics
Winchester Public Schools

Joseph L. Finigan, M.Ed.
Mathematics
Rivers School

Albert J. Finney, Jr., B.S.*
Accounting
Raytheon Company

Richard D. Fiorentino, M.B.A.
Marketing
Adage

Charles Fischer, Jr., M.S.
Finance
Digital Equipment Corp.

Daniel H. Fisher, B.S.
Medical Laboratory Science
Northeastern University

Harold R. Fisher, J.D.
Information Systems
Commonwealth of Massachusetts

Marjorie Fisher, B.S.
Health Record Administration
Harvard Univ. Health Services

Charles E. Fiske, C.A.G.S.
Law Enforcement
Boston Univ. School of Medicine

Pennryn Fitts, M.A.
Law Enforcement
Chelmsford Police Department

James E. Fitzgerald, M.A.
Modern Language

Leo J. Fitzgerald, M.B.A.*
Industrial Management
General Electric Co.

Kevin T. Fitzpatrick, M.B.A.*
Finance
Boston Public Library

J. Joseph Fitzsimmons, M.B.A.*
Management
Polaroid Corp.

Roberta Fitzsimmons, J.D.
Business Law
Attorney at Law

James C. Flaherty, M.L.S.
Library Science
Framingham Public Library

Richard E. Flaherty, M.P.A.
Law Enforcement
Metropolitan District Police

Ruth W. Flaherty, M.B.A.
Human Resources Management

Frances B. Fleming, B.F.A.
Art
Self-Employed

William P. Fleming, M.B.A.
Marketing
St. Elizabeth's Hospital

Myrtle R. Flight, J.D.
Business Law

David E. Floreen, M.P.A.*
Political Science
Massachusetts Bankers Assoc.

Leo M. Flynn, M.B.A.*
Real Estate
Leo Flynn, R.E. & Appraising

Peter E. Flynn, J.D.

Real Estate
Flynn Realty, Inc.

Thomas J. Flynn, J.D.

Human Resources Management
Thomas J. Flynn & Assoc.

William B. Flynn, Ph.D.

Psychology
Merrimack Valley College

Philip S. Fogelman, M.A.

Alt. Freshman/English

Martin E. Foley, M.P.A.*

Law Enforcement
Massachusetts State Police

Robert E. Foley, M.B.A.

Accounting
Council for Economic Action

Jennifer P. N. Foo, M.A.

Economics
Northeastern University

Armand L. Fortin, B.S.

Purchasing
Honeywell, Inc.

James Foss, Jr., LL.B.

Human Resources Management
Federal Mediation & Concil. Serv.

Douglas G. Foster, M.Ed.*

Earth Science
Catholic Memorial High School

Gale P. Foster, B.S.*

Marketing
Foster & Associates

Charles F. Fountain, M.S.

Journalism

Robert M. Fox, M.B.A.*

Marketing
Gerber Electronics

Walter Foxtree, M.A.T.*

Art
University of Massachusetts

Laura L. Frader, Ph.D.

History
Northeastern University

Thomas B. Francis, Jr., M.P.A.

Human Resources Management
City of Boston

Harriet Fraser

Alt. Freshman/Language Skills

Marie E. Fratoni, M.Ed.

Speech Communication

Howard H. Freedman, M.S.*

Accounting
Raytheon Company

Raoul M. Freyre, S.C.D.

Information Systems
University of Lowell

Melvin W. Friedman, M.B.A.*

Management
M. W. Friedman Associates

Martha R. Fuller, M.S.

English

Vincent J. Furlong, M.A.

Industrial Management
Defense Supply Agency

Neil A. Gaeta, M.S.

Radiologic Technology
Food & Drug Administration

Brian A. Gagne, M.B.A.

Real Estate
Chanter Development Corp.

W. Arthur Gagne, Jr., M.B.A.*

Management
Edadcon Services Co.

Kenneth W. Gagnon, B.S.

Law Enforcement
Chanter Development Corp.

Nona Gainsforth, B.A.

Music
Self-Employed

John M. Gale, M.B.A.

Radiologic Technology

Esther M. Gallagher, D.M.D.*

Health Science
Tufts University

Richard R. Gallagher, B.A.

Information Systems
Marshfield High School

Arthur R. Gallerani, M.B.A.

Hotel & Restaurant Management
Middlesex Community College

Gerald V. Galuardi, B.A.

Health Record Administration
N.E. Deaconess Hospital

Raul I. Garcia, D.M.D.

Health Science

A. Newall Garden, B.S.

Journalism
Raytheon Company

Rawle W. Garner, M.B.A.

Law Enforcement
New England Business Corp.

Donald E. Garrant, M.B.A.

Real Estate
Wakefield Savings Bank

Louise H. Garrido, J.D.

Business Law
Goodhue Colt & Steffensen

John D. Gavin, M.S.

Law Enforcement
Waltham District Court

Paul C. Gay, J.D.*

Business Law
Harrison & McGuire

Jonathan Gbur, M.B.A.

Transportation
Northern Transportation, Inc.

Sandra E. Geer, M.Ed.*

Psychology

Samuel S. Geller, M.B.A.

Accounting
RTC Systems, Inc.

Leanne M. George, B.A.

Art
Self-Employed

Anne M. Germain, Ph.D.

Information Systems
John Hancock Insurance Co.

Burton W. Gerrig, J.D.

Law Enforcement
Community Health

Lorine M. Getz, Ph.D.

Philosophy/Religion
Boston Theological Institute

Ara Ghazarians, M.A.

Sociology/Anthropology

David M. Ghazil, M.B.A.

Human Resources Management
Honeywell, Inc.

Peter F. Gibbs, M.B.A.

Transportation
Peter F. Gibbs & Associates

Katherine L. Gilbert, B.A.

Sociology/Anthropology
Northeastern University

Robert E. Gilbert, Ph.D.

Political Science
Northeastern University

Edwin S. Giles, Jr., B.S.*

Information Systems
Massachusetts Teachers Assoc.

La Rue W. Gilleland, M.A.

Journalism
Northeastern University

Ruth Gilleran, M.B.A.

Accounting
The Gillette Company

William J. Gillespie, Ph.D.

Therapeutic Recreation
Northeastern University

Alan B. Gladstone, B.S.*

Accounting
Alan Gladstone, CPA

Phyllis S. Glick, D.B.A.

Political Science
Division of Family Health

L. James Glinos, M.Ed.*

Human Resources Management
Glinos Associates

Shlomo Globerson, D.B.A.

Management
Northeastern University

Victor B. Godin, D.B.A.

Information Systems
Northeastern University

Maureen D. Goggin, M.A.

English
Northeastern University

Leonard B. Goldberg, B.A.

Radiologic Technology

Meryl Goldberg, M.A.

Music

Robert L. Goldberg, M.B.A.*

Management
John Hancock Dist., Inc.

Daniel Golden, Ph.D.

English
Northeastern University

Kenneth E. Golden, M.B.A.

Information Systems
Prime Computer, Inc.

Frederick T. Golder, Esq., LL.M.*

Human Resources Management
Self-Employed

Stan Goldman, J.D.*

Political Science
Mass. Dept. of Mental Health

Harold M. Goldstein, Ph.D.

Economics
Northeastern University

Howard I. Goldstein, J.D.

Business Law
Self-Employed

M. Alvin Goldstein, A.B.*

Information Systems
The Data Group Corp.

*Denotes senior lecturer as of October 1985.

Robert J. Goldstein, M.A.

Sociology/Anthropology
Pathways to Health

Roberta L. Golick, J.D.

Human Resources Management
Mass. Dept. of Labor & Industry

Judith R. Goodman, M.A.*

English

Leon M. Goodman, M.B.A.*

Management
Leon Goodman Associates

Robert S. Goodman, M.A.

Human Resources Management
Evans Product Co.

Frederick R. Goodridge, M.B.A.

Transportation
Frederick Goodridge Assoc.

Stephen Goodyear, M.A.*

Modern Language
Hull Public Schools

Pamela Gordan, E.D.

Alt. Freshman/English

Daniel D. Gordon, M.A.*

Economics
Salem State College

Myron S. Goretzky, Esq., J.D.

Hotel & Restaurant Management

S. Peter Gorshel, LL.B.

Real Estate
Self-Employed

Mary Jane Gorton, M.Ed.*

Art
Babson College

Leslie C. Gosule, B.S.*

Accounting
Leslie C. Gosule & Company

Amy S. Gottfried, M.A.

Alt. Freshman/English

Daniel Z. Gould, M.B.A.*

Industrial Management
GenRad, Inc.

Saeed Gozashti, M.S.

Chemistry
Northeastern University

David F. Grace, C.A.G.S.*

English
Lasell Junior College

Daniel A. Grady, M.B.A.*

Accounting
Bose Corp.

William E. Grady, B.S.*

Industrial Management
Grady & Associates

Robert T. Granfield, M.A.

Sociology/Anthropology
Northeastern University

Daniel J. Grant, Jr., M.A.

Art
Avco Systems

William H. Grass, M.A.

Music
Boston Conservatory of Music

Leon S. Graubard, M.A.*

Economics
Worcester Polytechnic Institute

Lewis Greenberg, M.A.

Psychology
Northeastern University

Claire M. Greene, M.B.A.

English/Marketing
Northeastern University

John T. Gregg, B.A.*

Real Estate
Beal & Company

Kristo A. Gregory, M.B.A.*

Finance
Prudential Bache Securities

Ann M. Grennell, M.A.

Alt. Freshman/History
Boston College

Gerald R. Griffin, Ph.D.*

English
Northeastern University

John L. Griffith, B.S.*

Management
State Dept. of Environmental Mgt.

Donna P. Grosjean, B.S.

Biology
Brigham & Womens Hospital

Sidra Gruss-Lotman, M.A.

Therapeutic Recreation
H. Lotman and Co., Inc.

John J. Guarino, M.S.

Biology
Northeastern University

Cherif Guenoune, M.A.

Sociology/Anthropology

Ronald E. Guittarr, B.S.*

Human Resources Management
Raytheon Company

Reginald W. Hache, M.A.*

Music
Northeastern University

Edward A. Hacker, Ph.D.*

Philosophy/Religion
Northeastern University

Joanna Hadjicostandi, M.A.

Sociology/Anthropology
Northeastern University

William T. Hadley, B.S.

Marketing
The Hadley Company

Vivian M. Haggis, M.S.

Information Systems

Gary J. Hajduk, M.B.A.

Finance
Designpak Inc.

Monica M. Halas, J.D.

Human Resources Management
Greater Boston Legal Services

Kenneth W. Hale, M.B.A.

Accounting
Ernst & Whinney

John P. Haley, C.A.G.S.

Information Systems
City of Revere

Jay A. Halfond, M.B.A.

Management

Barry D. Hall, B.S.

Radiologic Technology
Brigham & Womens Hospital

James F. Hall, M.A.

Chemistry
Northeastern University

John F. Halloran, B.A.

Marketing
Jacksonville Port Authority

Paul M. Halloran, B.S.*

Information Systems
Raytheon Company

Michael C. Halpern, B.S.

Information Systems
Comp. All Systems, Inc.

Pamela A. Halpern, M.S.

Information Systems
Comp. All Systems, Inc.

Donald J. Halpin, M.B.A.*

Finance
Winchester Financial Mgt. Corp.

Isadore Halzel, M.B.A.*

Management
Charles Stark Draper Labs

Jacalyn S. Hamada, B.A.*

Therapeutic Recreation
Boston University

Paula J. Hammett, B.S.

Medical Laboratory Science
Corning Medical

Susan C. Hammond, C.P.A.

Accounting
The Yankee Co., Inc.

Suzanne L. Hamner, M.A.

Alt. Freshman/History

William F. Hancock, Jr., M.B.A.*

Finance
Digital Equipment Corp.

Carolyn Haneke, B.A.

Technical Communications
Self-Employed

Francis R. Hankard, M.A.*

Law Enforcement
Mass. Dept. of Public Safety

Mary V. Hanley, M.A.

Nursing

Christine M. Hannula, B.A.

Technical Communications
Wang Laboratories

Robert A. Hannula, M.A.

Technical Communications
Digital Equipment Corp.

Joseph J. Hansen, M.B.A.*

Mathematics
Raytheon Company

Norman E. Hansen, M.B.A.*

Marketing
Mount Ida College

Melanie I. Harasym, M.S.

Biology

Richard A. Hargreaves, M.A.

Mathematics
Westwood High School

Priscilla G. Harmel, M.Ed.

Drama

Joyce L. Harper, M.A.

Technical Communications
Northeastern University

David J. Harrigan, M.B.A.*

Management Sciences
D. J. Harrigan Associates

Paul E. Harrington, M.S.

Economics
Northeastern University

Raymond P. Harrington, Ph.D.

Alt. Freshman/History

Ruth Ann M. Harris, Ph.D.*

History
Northeastern University

*Denotes senior lecturer as of October 1985.

- David Harrison, M.S.**
Management
The Carlson Corp.
- Thomas M. Hart, M.S.**
Accounting
U.S. Treasury
- Harold Harutunian, Ph.D.***
Mathematics
Salem State College
- Ruth Harutunian, C.A.G.S.**
Mathematics
Watertown School Department
- Kathleen M. Harvey, M.Ph.**
Health Science
Commonwealth of Massachusetts
- Martha S. Hassell, B.A.**
Art
N.E. School of Photography
- Eva C. Havas, Ph.D.**
Sociology/Anthropology
Northeastern University
- Donald R. Hayden, B.S.***
Information Systems
Digital Equipment Corp.
- David W. Hayes, Esq., LL.M.**
Political Science
The Seiler Corporation
- Kathleen H. Hayes, M.Ed.**
Women's Career Program
Northeastern University
- Robert T. Heald, M.B.A.***
Accounting
Heald Hoffmeister and Co.
- A. R. Heanue, B.A.**
Transportation
Heanue Management Services
- James L. Hearn, M.B.A.**
Health Management
Peer Review Analysis, Inc.
- Warren K. Heckman, M.A.***
Management
W. K. Heckman Associates, Inc.
- Barbara A. Heffner, M.S.**
Technical Communications
McCormack and Dodge
- F. Timothy Hegarty, Jr., J.D.**
Real Estate
Norfolk & Dedham Fire Ins. Co.
- Stephen J. Heinen, B.A.**
Psychology
Northeastern University
- Louise H. Hekimian, M.B.A.**
Management
- Patricia Heller, M.S.**
Health Record Administration
Northeastern University
- Les K. Hemmings, M.Ed.**
Management
- Maher M. Henary, B.S.**
Chemistry
Northeastern University
- Thomas R. Henderson, Jr., M.B.A.**
Accounting
Polaroid Corp.
- Robin M. Hendrich, Ed.D.***
Music
Northeastern University
- George S. Hennessy, M.B.A.***
Marketing
Xyplex
- Gerald H. Herman, M.A.***
History
Northeastern University
- George M. Herrick, M.B.A.***
Finance
John E. Cain Co.
- Wayne C. Heward, M.B.A.**
Human Resources Management
Northrop Corp.
- Jennifer N. G. Hicks, M.A.**
English
University of Massachusetts
- Michael J. Hicks, M.B.A.**
Information Systems
Beverly Hospital
- Robert L. Hicks, M.B.A.**
Finance
Bridgewater State College
- Chester W. Higgins, Ph.D.***
Management
- Peter Higgins, M.B.A.***
Accounting
Xtrax Corp.
- Sean T. Higman, M.B.A.**
Accounting
Sanders Associates, Inc.
- Lloyd H. Hill, J.D.**
Human Resources Management
City of Quincy
- Stephen A. Hiltz, M.A.**
Alt. Freshman/History
Northeastern University
- James R. Hindman, M.B.A.***
Human Resources Management
Northrop Corp.
- William G. Hines, B.S.**
Marketing
- David C. Hirsch, Ph.D.**
Technical Communications
Massasoit Community College
- Christine L. Hobart, D.B.A.**
Human Resources Management
Northeastern University
- Mark O. Hodgson, M.A.**
Sociology/Anthropology
McLean Hospital
- Therese M. Hofmann, M.A.**
Speech Communication
Seabird Associates
- Lisa M. Holt, M.A.**
Speech Communication
- John E. Hopkins, M.B.A.**
Marketing
Codex Corp.
- Morris Horowitz, Ph.D.**
Economics
Northeastern University
- Geralyn Horton, M.A.**
Alt. Freshman/Language Skills
- John W. Hosmer, Jr., M.B.A.**
Finance
Boston Five Cent Savings Bank
- William J. Hourihan, Ph.D.**
History
Northeastern University
- Donald R. Howard, B.A.**
Economics
Northeastern University
- Elizabeth P. Howard, M.S.**
Nursing
Simmons College
- Martin J. Howard, M.B.A.**
Accounting
Boston University
- Jane A. Howe, B.S.**
Sociology/Anthropology
- Jane T. Howe, M.B.A.**
Finance
- Richard C. Howland, B.A.**
Journalism
BASF Systems Corp.
- George B. Hrabec, M.S.**
Medical Laboratory Science
Whidden Memorial Hospital
- Thomas J. Hubbard, M.B.A.**
Marketing
Epson America, Inc.
- Margaret C. Huff, B.A.**
Philosophy/Religion
- Anthony H. Hull, Ph.D.***
History
U. Mass/Boston
- Thomas K. Humphreys, M.A.**
Economics
Kidder Peabody & Co.
- Philip M. Hurdle, M.B.A.**
Management
McLean Communications, Inc.
- Daniel F. Hurley, LL.B.***
Human Resources Management
Consultant
- Roger Hurwitz, M.A.**
Political Science
Massachusetts Institute of Technology
- Linda A. Hyde, B.S.**
Health Record Administration
Medical Systems, Inc.
- Masanori Ichizawa, Ph.D.**
Philosophy/Religion
- Jack F. Ingalls, M.S.***
Law Enforcement
Consultant
- John J. Irwin, Jr., J.D.***
Law Enforcement
Massachusetts Supreme Court
- Muhammad F. Islam, M.A.**
Economics
Northeastern University
- Herbert H. Itzkowitz, M.B.A.***
Accounting
Forman, Itzkowitz & Berenson
- Carl J. Izzo, B.S.**
Real Estate
Bank of Boston
- Judith Jack, B.A.**
Technical Communications
GTE Corp.
- Charles E. Jackson, B.A.**
Marketing
New England Advertising Week
- Phillip S. Jackson, Esq., LL.B.***
Business Law
Self-Employed

*Denotes senior lecturer as of October 1985.

Donald M. Jacobs, Ph.D.

History
Northeastern University

Arthur I. Jacobsen, M.B.A.

Finance
Genesis Properties

Karen Jacobsen, B.A.

Health Management
Northeastern University

Joshua R. Jacobson, M.A.

Music
Northeastern University

Thomas E. Jaillet, M.A.*

Mathematics
Sandwich High School

Paul L. Jalbert, Ph.D.

Sociology/Anthropology
Northeastern University

Richard A. James, M.B.A.

Human Resources Management
Uniglobe Advantage Travel

Paul A. Janell, Ph.D.

Accounting
Northeastern University

Nan-In Jang, B.S.

Chemistry
Northeastern University

Edward L. Jaye, M.B.A.

Marketing
Brooks Automation

Georgeann Jenkins, M.Ed.

Radiologic Technology
Boston City Hospital

Annette S.L. Johansson-Los, M.A.

Speech Communication
Self-Employed

Carson C. Johnson, Jr., Ph.D.*

Psychology
Emmanuel College

Donald R. Johnson, M.B.A.*

Human Resources Management
New England Telephone Co.

Janet Johnson, M.B.A.

Finance
Citizen Bank

Marsha Johnson, M.A.

Music
Boston Bay Capitol, Inc.

Richard F. Johnson, Ph.D.

Psychology
U.S. Army Research Institute

Robert F. Johnson, J.D.*

Law Enforcement
First Security Service Corp.

Rosaleen M. Johnson, M.A.

Mathematics
Milford High School

James R. Johnston, B.S.

Real Estate
Equitable Life Ins. Co.

Joseph M. Jordan, M.P.A.*

Law Enforcement

David M. Joulfaian, M.A.

Economics
Mass. Dept. of Revenue

James M. Joyce, M.B.A.

Transportation
Stop & Shop Co., Inc.

Jane Joyce, M.Ed.

Women's Career Program
Sweetheart Products Group

Joseph A. Kaczenas, M.B.A.*

Information Systems
N.E. Mutual Life Ins. Co.

Mark H. Kaizerman, M.B.A.

Accounting
W. F. Wood Corp.

Katherine M. Kalliel, M.Ed.

Women's Career Program
Boston University

Edward L. Kandib, M.Ed.*

Accounting
Public Accountant

Charles F. Kane, M.B.A.

Finance
Prime Computer

Donald E. Kane, M.P.A.

Law Enforcement
Barnstable Police Department

Martin J. Kane, M.B.A.*

Purchasing
Raytheon Company

Edward M. Kaplan, M.S.

Information Systems
Massachusetts General Hospital

Mort S. Kaplan, M.A.*

English
Northeastern University

Judith Kapuscinski, M.Ph.

Health Management

Steven D. Karchmar, M.B.A.

Human Resources Management
Wyman-Gordon Co.

Ramakrishna Karedla, A.B.

Alt. Freshman/Mathematics

Gary M. Karelis, M.B.A.*

Accounting
Karelis Realty

Charles Karis, Ph.D.

Psychology
Northeastern University

Ann C. Karnofsky, M.A.

Music

Catherine A. Karp, M.S.

Biology
Joslin Diabetes Center

Deborah S. Katz, M.B.A.

Finance
Hilton Walker & Books

Robert S. Katz, B.S.

Journalism
Transcript Newspapers, Inc.

Ronald P. Kaufman, B.S.*

Law Enforcement
Mass. Dept. of Public Safety

Walter E. Kearney, M.B.A.*

Accounting
Northeastern University

John S. Kearns, Ph.D.

Psychology

John Keating, M.S.

Alt. Freshman/Mathematics

Philip E. Keith, M.B.A.

Management
Controlonics Corp.

Jeffrey W. Kelly, A.S.

Radiologic Technology
St. Anne's Hospital

Thomas W. Kelly, M.B.A.*

Information Systems
Massachusetts General Hospital

Edward C. Kennedy, B.S.

Law Enforcement

Thomas J. Kennedy, M.B.A.

Finance
MBTA

James M. Kenney, M.B.A.

Management Sciences
Polaroid Corp.

Margaret L. Kent, M.A.

English

Philip M. Keohane, M.A.

Journalism
GTE Corp.

Janice D. Keough, M.A.

English
North Shore Community College

Jill P. Kern, M.B.A.

Management Sciences
Digital Equipment Corp.

Robert H. Ketchum, D.B.A.

Management
Northeastern University

Raht Ketusingha, M.A.

Economics
Northeastern University

Sylvia P. Keyes, M.B.A.

Management
Bridgewater State College

Brian L. King, M.B.A.*

Marketing
Avco Systems Division

Janet M. King, Ph.D.

English

Marilyn King, M.S.

Nursing
Northeastern University

Sandra J. King, B.S.*

Information Systems
Shawmut Bank of Boston

Sandra T. King, M.B.A.

Marketing
Wear Guard

Gary F. Kinsella, J.D.*

Political Science
Attorney at Law

Paul G. Kinsella, B.S.*

Real Estate
Commonwealth Real Estate Group

Joseph N. Kiy, Ph.D.

Political Science

James P. Kneeland, M.B.A.

Information Systems
F. Data Systems Inc.

Claire E. Knox, M.L.S.*

English
Boston University

John L. Kobrick, Ph.D.*

Psychology
U.S. Army Research Institute

Joan A. Koffman, J.D.

Real Estate
Northeastern University

Bernhard J. Kohler, M.B.A.*

Industrial Management
Polaroid Corp.

*Denotes senior lecturer as of October 1985.

- Gerald G. Kokos, M.B.A.
Finance
Prime Computer, Inc.
- Anja S. Kondo, M.A.
Sociology/Anthropology
- Constantina Kondopoulos, M.A.
Alt. Freshman/Sociology
- Kenneth M. Kopeck, M.D.
Health Science
- Roberta L. Kosberg, Ph.D.
Speech Communication
Northeastern University
- James F. Kovacevic, A.S.
Art
Mark Burton, Inc.
- Bennett L. Kramer, M.S.*
Information Systems
Massasoit Community College
- Rheta I. Kramer, M.A.
Mathematics
- Willard Krasnow, J.D.
Human Resources Management
Raytheon Company
- Elliott A. Krause, Ph.D.
Sociology/Anthropology
Northeastern University
- David H. Kravetz, J.D.*
Business Law
Attorney at Law
- Steven A. Kravetz, M.B.A.
Accounting
Apparel Retail Corp.
- Jane M. Kretchman, M.S.*
Medical Laboratory Science
Computers in Medicine
- Laura J. Krims, Esq., J.D.
Business Law
Ficksman & Conley
- Marcia A. Krolkowski, M.S.
Finance
Compugraphic Corp.
- Michael P. Krone, Esq., J.D.
Business Law
Attorney at Law
- Howard S. Kruger, B.S.
Health Science
Northeastern University
- Susan R. Kuder, M.A.
English
Century 21 Silva Realty
- Sudhir K. Kulkarni, M.S.
Chemistry
Northeastern University
- Daniel D. Kurylo, M.A.
Psychology
Northeastern University
- Ann E. Kuzdale, M.A.
Alt. Freshman/History
- Stephen Kwan, D.B.A.
Information Systems
Northeastern University
- Anthony J. LaCava, Jr., B.S.
Marketing
Peat Marwick Mitchell & Co.
- William R. LaCourse, B.S.
Chemistry
Northeastern University
- Bruce G. LaFlamme, M.S.W.
Health Management
Mass. Dept. of Mental Health
- Wendy W. Laird, M.S.
American Sign Language
- Nancy E. Lambert, D.B.A.
Marketing
Northeastern University
- Paul K. Lambert, M.B.A.*
Transportation
Consultant
- Philip J. Lamy, M.A.
Sociology/Anthropology
Essex Institute
- Stephen R. Lancey, Ph.D.
Psychology
Boston VA Medical Center
- Robert H. Landry, M.B.A.*
Accounting
Massasoit Community College
- Gabriel Lanyi, Ph.D.
Technical Communications
- Stephen R. Larson, M.S.
Chemistry
Northeastern University
- Pearl L. Lau, B.A.
Art
Little Brown Publishing Co.
- Philip J. Laurens, M.S.*
Mathematics
Bentley College
- Irma H. Lauter, M.S.M.E.
Information Systems
NYNEX
- Joan H. Lautman, M.A.
Drama
Metro. Area Planning Council
- Cindy P. Lawler, M.A.
Psychology
Northeastern University
- Charles E. Lawton, M.Ed.
English
Rhode Island College
- Alfred Lazzeri, M.F.A.*
Art
Walpole High School
- James N. LeBlanc, M.A.
Information Systems
Burlington Schools
- Paul A. LeBlanc, M.B.A.
Finance
Digital Equipment Corp.
- Stewart L. Lebo, M.S.
Information Systems
Bank of Boston
- Hollington Lee, B.S.
Biology
Forsyth Dental Center
- Carlton Lehmkuhl, Ph.D.
Alt. Freshman/Mathematics
- Constance Leigh, M.A.
English
- D. Paul Leitch, Ph.D.
Psychology
U.S. Army Natick R&D Command
- Bernard J. Lemire, B.S.
Chemistry
Northeastern University
- Daniel A. Lennon III, M.A.
Sociology/Anthropology
Northeastern University
- Philip W. Lequesne, Sc.D.
Chemistry
Northeastern University
- Thomas R. Lerra, Ph.D.
Management
American Institute of Banking
- Mary F. Leslie, M.Ed.
Alt. Freshman/Language Skills
Northeastern University
- Marvin X. Lesser, Ph.D.
English
Northeastern University
- Albert M. Levenson, M.B.A.*
Management Sciences
Charles Stark Draper Labs
- Ronald M. Levenson, B.S.
Accounting
Peat Marwick Mitchell & Co.
- George E. Levesque, M.S.
Information Systems
Massachusetts General Hospital
- Barry S. Levine, M.Ed.
Health Science
Self-Employed
- Philip A. Levy, B.A.
Technical Communications
Computervision Corp.
- David J. Lewer, M.B.A.
Management
Northeast Leasing Assoc., Inc.
- Stephen P. Lewontin, Ph.D.
Political Science
Gamma-Liaison Photo News
- Domenic J. Liberatore, M.B.A.
Industrial Management
Raytheon Company
- Sandra M. Licker, M.S.
Information Systems
Raytheon Company
- Richard Lindhe, D.B.A.
Accounting
Northeastern University
- Joanne G. Linowes, M.A.*
Speech Communication
Research Communications, Inc.
- Robert L. Litrownik, Ph.D.
Psychology
Mystic Valley Mental Health Ctr.
- George F. Litterst, M.A.
Music
N.E. Conservatory of Music
- Walter A. Littlefield, M.A.
Speech Communication
Emerson College
- Thomas E. Littlehale, M.Ed.*
Information Systems
John Hancock Life Ins. Co.
- J. Antony Lloyd, M.A.*
English
Beth Israel Hospital
- Jeannie E. Lloyd, M.A.
Alt. Freshman/English
- Joseph S. Lo Castro, Ph.D.*
Psychology
Boston VA Medical Center

*Denotes senior lecturer as of October 1985.

- Helen M. Loeb, Ph.D.**
Technical Communications
Applied Expert Systems
- Cary P. Logan, M.D.**
Health Science
- Richard C. Logan, M.B.A.***
Health Management
Massachusetts General Hospital
- Edward J. Lonczak, M.B.A.***
Management
Commercial Union Insurance Co.
- Miller C. Lovett, Ph.D.***
Management
University of Mass/Boston
- Hope E. Luder, M.A.**
History
Burlington High School
- Daniel G. Lutts, M.A.**
Technical Communications
Information Resources, Inc.
- Daniel W. Lyons, J.D.**
Business Law
Silver & Ahern
- Paul E. Lyons, B.S.***
Industrial Management
The Gillette Company
- Paul E. Lyons, M.Ed.**
Mathematics
Cambridge School Department
- Robert L. Mabardy, M.B.A.***
Human Resources Management
Ram Contracting, Inc.
- William J. Macanka, Ph.D**
Chemistry
Regis College
- Andrew C. MacAulay, M.S.***
Chemistry
N.E. Medical Center Hospital
- Edward R. MacCormack, M.P.A.***
Law Enforcement
Boston Edison Company
- Joseph L. K. MacDonald, B.S.**
Therapeutic Recreation
Parks and Recreation Department
- Patricia R. MacDonald, M.A.**
English
- Thomas J. MacDonough, M.A.***
History
Town of Norwood
- Harry A. MacKay, Ph.D.**
Nursing
Northeastern University
- Ronald C. MacKay, M.A.**
English
Northeastern University
- Alan A. Mackey, A.M.***
Mathematics
Registry of Motor Vehicles
- Charles M. MacLean, J.D.**
Law Enforcement
Attorney at Law
- Sylvia A. MacPhee, M.S.***
Sociology/Anthropology
Lasell Junior College
- Edward F. Madden, A.B.**
Law Enforcement
Mass. Bay Investigators
- William J. Madden, B.S.***
Accounting
Self-Employed
- Michael J. Maggard, D.B.A.**
Management
Northeastern University
- Judith Magidson, M.Ed.**
Alt. Freshman/Language Skills
Northeastern University
- Dominic J. Magnarelli, J.D.**
Mathematics
Wilmington Public Schools
- John A. Maguire, B.S.***
Information Systems
Guilford Transportation
- Thomas J. Maguire, J.D.**
Law Enforcement
- Timothy J. Maher, Ph.D**
Health Science
Mass. College of Pharmacy
- Sabri S. Mahmoud, Ph.D.**
Chemistry
Northeastern University
- John J. Mahon, J.D.**
Human Resources Management
Raytheon Company
- James P. Mahoney, Esq., J.D.**
Health Record Administration
Boston City Hospital
- Susan S. Maire, J.D.**
Business Law
- Robert E. Mairs, B.S.***
Human Resources Management
Raytheon Company
- George P. Makris, B.S.**
Marketing
Northeastern University
- Helen C. Makris, M.Ed.**
Alt. Freshman/English
- Hamdy M. Maksoud, M.S.**
Chemistry
Northeastern University
- Judith Mallette, B.S.**
Mathematics
- Robert G. Mallion, M.A.**
Earth Science
Tasc Analytic Science Corp.
- John F. Maloney, M.Ed.**
Mathematics
Boston Latin School
- Shanrokh S. S. Manesh, M.S.**
Mathematics
- Jeremiah J. Manfra, B.S.**
Law Enforcement
Boston Police Department
- George J. Manikas, B.S.***
Law Enforcement
Raytheon Company
- Anne S. Manion, M.B.A.**
Health Science
- Albert R. Manson, M.Ed.***
Information Systems
Honeywell Information Systems
- Jack J. Manuel, Ph.D.***
Philosophy/Religion
Creative Humanistics, Inc.
- John A. Manzo, Jr., M.S.***
Industrial Management
N.E. Medical Center Hospital
- Barbara B. Marcel, M.A.**
Psychology
Northeastern University
- Marie D. Marchesano, B.A.**
Technical Communications
Self-Employed
- Alfred G. Marcotte, M.S.E.E.***
Mathematics
LFE Corp.
- Sophia Margotta, D.B.A.**
Finance
Northeastern University
- Julius Mariasis, M.B.A.***
Management
World Markets, Inc.
- Steve J. Marino, B.S.**
Alt. Freshman/Mathematics
North Intermediate School
- Robert E. Marotta, B.A.**
Technical Communications
Digital Equipment Corp.
- Rosemary T. Marotta, Ed.D.**
English
Apollo Computer
- Lynn W. Marples, M.B.A.**
Finance
Northeastern University
- Bruce E. Marquis, M.A.**
Health Management
Results Service Co., Inc.
- Arnold M. Marrow, Esq., LL.B.***
Human Resources Management
National Labor Relations Board
- Stephanie K. Marrus, M.B.A.**
Marketing
- Barry H. Marshall, M.B.A.***
Accounting
Digital Equipment Corp.
- Barbara E. Martin, B.A.**
Medical Laboratory Science
Northeastern University
- John A. Martin, M.B.A.***
Accounting
Northeastern University
- John B. Martin, B.S.**
Information Systems
Raytheon Data Systems
- John J. Martin, M.B.A.***
Human Resources Management
Federal Mediation & Concil. Services
- Leo J. Martin, B.S.***
Law Enforcement
- James F. Mason, M.B.A.**
Marketing
- John L. Mason, J.D.**
Real Estate
Mason Goldman & McAuliffe
- Richard P. Mason, M.B.A.***
Information Systems
Avco Corp.
- Russell B. Mason, M.B.A.***
Marketing
Raytheon Company
- Joseph D. Mastone, M.A.**
Law Enforcement
EG&G Bionomics
- Burton N. Matross, M.B.A.**
Information Systems
General Electric Company

*Denotes senior lecturer as of October 1985.

George D. Matson, M.A.*
Speech Communication
 Hesser College

Kevin E. Mautte, M.S.
Biology
 Northeastern University

Lawrence H. Mayer, B.S.
Human Resources Management
 Raytheon Company

Kelly Mayo, M.S.
Nursing
 Northeastern University

Teresa A. Mayors, M.A.
Sociology/Anthropology
 Northeastern University

Shampa Mazumdar, B.A.
Sociology/Anthropology
 Northeastern University

James J. Mazza, M.P.A.*
Law Enforcement
 Woburn Police Department

Michael V. McAulay, A.S.
Technical Communications
 Digital Equipment Corp.

Gerald S. McAuliffe, J.D.*
Law Enforcement
 Attorney at Law

Robert P. McAuliffe, M.B.A.*
Marketing
 Genrad, Inc.

Ronald J. McBrien, M.B.A.
Marketing
 Olin Corp.

Paula E. McCabe, M.A.
Sociology/Anthropology
 Northeastern University

Larry D. McCargar, Ph.D.
Philosophy/Religion

Daniel J. McCarthy, D.B.A.*
Management
 Northeastern University

Francis J. McCarthy, M.B.A.
Information Systems
 Leverone & Company, C.P.A.

John D. McCarthy, M.P.A.
Accounting
 U.S. Defense Department

John J. McCarthy, Jr., M.B.A.
Marketing

Rita M. McCarthy, M.B.A.
Marketing
 D. C. Heath & Company

William S. McCarthy, J.D.
Law Enforcement
 Attorney at Law

Jeffrey C. McConnell, M.A.
Philosophy/Religion
 Massachusetts Institute of Technology

John E. McCormack, M.B.A.
Accounting
 Youville Hospital, Inc.

Gail McCormick, B.A.
Hotel & Restaurant Management

Leo F. McCue, Jr., Ph.D.*
History
 Central Catholic High School

Joseph P. McDermott, M.Ed.
Mathematics
 Algonquin Regional High School

Joseph T. McDonnell, B.S.
Law Enforcement
 Mass. District Court System

Lloyd W. McElaney, M.Ed.
Information Systems
 Dept. of Public Welfare

Robert M. McEntire, Ph.D.
Speech Communication

Patrick J. McGeary, M.A.
English
 Software International

Daniel R. McGrath, M.Ph.
Psychology
 Northeastern University

John B. McGrath, B.S.*
Finance
 New England Telephone Co.

Mimi M. McGrath, M.A.
Women's Career Program
 Mimi McGrath Consultants

Eugene F. McGrory, B.A.
Accounting
 Internal Revenue Service

James L. McGuinness, Jr., M.B.A.*
Accounting
 EG&G, Inc.

Thomas J. McHugh, M.B.A.*
Finance
 Self-Employed

Robert A. McKean, M.A.
Technical Communications
 Chart Communications

Raymond P. McKeon, M.P.A.
Law Enforcement
 Chelmsford Police Department

Kevin J. McLatchy, M.F.A.
Art
 Self-Employed

June E. McLaughlin, M.S.
Health Management
 Youville Hospital, Inc.

Mark W. McLaughlin, M.A.
English

Paul D. McLaughlin, M.S.W.
Health Management
 Central Boston Elder Services

Robert W. McLean, M.B.A.
Hotel & Restaurant Management
 Self-Employed

Thomas C. McLellan, M.S.
Accounting
 Investors Relocation Group

Denise M. McMahon, B.S.
Music
 St. Andrew's Episcopal Church

Joseph W. McNabb, M.A.
Health Science
 Laboure College

Pauline M. McNulty, B.S.
Information Systems
 Self-Employed

Clay McShane, Ph.D.
History
 Northeastern University

Michael S. Mehrmann, Esq., A.S.
Business Law
 Law Office of I. Oppenheim

Janice B. Meisenhelder, M.S.
Nursing

Frank D. Mele, B.S.*
Accounting

Bruce A. Mellin, M.S.*
Earth Science
 Town of Chelmsford

Dirshaye Menberu, M.S.
Chemistry
 Northeastern University

Michael E. Merisotis, B.S.
Health Record Administration
 Somerville Hospital

Lloyd B. Merrill, B.S.
Information Systems
 Grossman's, Inc.

George B. Merry, A.B.*
Journalism
 Christian Science Publishing

Charles A. M. Meszoely, Ph.D.*
Biology
 Northeastern University

Leonard F. Meuse, Jr., M.B.A.
Technical Communications
 Polaroid Corp.

Michael E. Meyer, Ph.D.
Philosophy/Religion
 Northeastern University

Peter N. Michaelson, M.B.A.
Marketing
 Maslow Gold & Rothschild, Inc.

Ronald L. Michaud, Ph.D.
Psychology

Bernard Michels, M.A.
Sociology/Anthropology
 Brandeis University

Elmer B. Michelson, M.A.*
English

Philip R. Miles, M.B.A.
Accounting
 Polaroid Corp.

Adriene R. Miller, M.A.
Sociology/Anthropology
 Northeastern University

Charles J. Miller, M.S.
Information Systems

Mary-Margaret Miller, B.S.
Information Systems
 Codman & Shurtleff, Inc.

Eileen T. Mills, M.A.
Alt. Freshman/English

Patrick N. Mingolelli, M.B.A.
Accounting
 Digital Equipment Corp.

Robert J. Minichiello, D.B.A.
Marketing
 Northeastern University

Helena C. Minton, M.F.A.
English
 University of Lowell

Richard R. Miranda, M.B.A.*
Purchasing
 South Shore Bank

Kamlesh Misra, M.A.
Alt. Freshman/Economics
 Charles E. Mokotoff, M.A.

Music

*Denotes senior lecturer as of October 1985.

- James F. Molloy, Jr., M.B.A.**
Transportation
Northeastern University
- Stephen P. Molloy, R.R.A., B.A.**
Health Record Administration
- Lawrence F. Monaghan, B.S.**
Information Systems
First National Bank
- Robert L. Montminy, B.S.**
Information Systems
Marshfield School Department
- Rajen Mookerjee, M.A.**
Economics
Northeastern University
- John L. Moore, M.F.A.**
Art
- Patricia A. Moore, M.A.**
Health Science
Laboure Junior College
- Thomas E. Moore, D.B.A.**
Marketing
Northeastern University
- Patricia B. Moran, M.Ed.**
Mathematics
Saugus High School
- Leslie B. Morash, M.B.A.***
Transportation
- William R. Morin, B.S.**
Information Systems
MBTA
- Jerry A. Morris, M.B.A.***
Human Resources Management
Asquith & Jackson Assoc.
- Richard M. Morrison, M.B.A.***
Information Systems
Strategic Planning Institute
- Mary Morrissey, M.A.**
Alt. Freshman/English
- Peter J. Morrissey, B.S.**
Information Systems
MBTA
- Mark B. Moss, Ph.D.***
Psychology
University Hospital
- Henry A. Moultrie II, M.B.A.**
Management
Mission Church of Christ, Inc.
- Edmond J. Moussally, M.Ed.**
Music
Northeastern University
- Carl F. Moxey, Ph.D.**
Biology
Self-Employed
- James D. Mukjian, M.B.A.***
Industrial Management
U.S. Defense Logistics Agency
- Barbara Mulcahy, M.A.**
Alt. Freshman/English
- John Mulhall, M.A.**
Alt. Freshman/Language Skills
- Edward J. Mulholland, Ph.D.**
Economics
Regis College
- Paul V. Mulkern, M.S.***
Human Resources Management
- Robert W. Mullaly, Ph.D.**
Psychology
Mullaly Associates
- Edmund J. Mullen, M.Ed.***
History
Northeastern University
- Francis E. Mullen, B.S.***
Law Enforcement
Quincy Police Department
- William S. Mullen, M.A.***
Political Science
Foxboro School System
- Ramaswami Murali, D.B.A.**
Finance
Northeastern University
- Charles W. Murphy, M.B.A.***
Finance
Bunker Hill Community College
- Daniel C. Murphy, M.S.**
Journalism
Malden Evening News
- David M. Murphy, Ph.D.**
Speech Communication
- James F. Murphy, B.S.**
Law Enforcement
Haverhill Police Department
- Kevin Murphy, M.A.**
Art
American Landmarks
- Paul J. Murphy, J.D.***
Management
General Electric Company
- Richard T. Murphy, M.Ed.**
Mathematics
Boston Public Schools
- Vyasaraj V. Murthy, M.B.A.**
Management Sciences
Digital Equipment Corp.
- John A. Mylotte, B.A.**
Technical Communications
Navy Cloth & Textile Research
- Afsaneh Nahavandi, M.B.A.**
Human Resources Management
Northeastern University
- Julie M. Nardone, M.A.**
Sociology/Anthropology
- Shashi Nath, Ph.D.***
Sociology/Anthropology
- Mohammed A. Nawawi, Ph.D.**
Political Science
Northeastern University
- Barbara E. Neale, M.Ed.**
Speech Communication
Independent Concept Consultants
- William P. Needham, M.A.**
Psychology
Northeastern University
- Theodore H. Needle, B.S.***
Accounting
Needle & Needle
- Mitchell J. Nelles, Ph.D.**
Biology
Cambridge Research Laboratory
- Carl W. Nelson, D.B.A.**
Management
Northeastern University
- David C. Nelson, B.S.***
Accounting
Self-Employed
- Cynthia J. Neumann, M.S.**
Nursing
Visiting Nurse Assoc. of N.S.
- Floyd Newton, M.A.**
Art
Revolver, Inc.
- Thomas J. Neylon, Jr., M.A.***
English
Watertown Public Schools
- Janet M. Nichols, M.B.A.**
Management
Self-Employed
- Bruce E. Nickerson, Ph.D.***
English
Avco/Textron
- Marion L. Niernitz, C.A.G.S.**
Human Resources Management
John Hancock Life Insurance Co.
- Gunnar Y. Nilsson, B.A.**
Art
Hewlett-Packard Corp.
- James C. Nolan, M.S.W.**
Human Resources Management
MBTA
- Seyed H. Noorian, M.B.A.**
Finance
- John H. Northrup, Ph.D.**
Accounting
Northeastern University
- Richard W. Norton, B.A.***
Information Systems
- Vincent G. Norton, M.B.A.**
Human Resources Management
Raytheon Company
- Edward G. Novello, M.B.A.***
Transportation
Best T&D Associates
- Alexander S. Nunes, M.S.**
Information Systems
Data General Corp.
- Norbert F. Nunes, M.A.***
English
Mass. Bay Community College
- Azinna Nwafor, Ph.D.**
Political Science
- David H. O'Brien, M.B.A.***
Accounting
N.E. Merchants Bank
- Ellen G. O'Brien, M.Ed.**
Human Resources Management
Digital Equipment Corp.
- John E. O'Brien, M.B.A.**
Human Resources Management
Hospital Association
- Richard J. O'Brien, B.S.**
Information Systems
Massachusetts General Hospital
- Robert M. O'Brien, B.S.***
Information Systems
Northeastern University
- William T. O'Brien, M.P.A.***
Law Enforcement
Boston Police Department
- Frederick T. O'Connell, J.D.**
Accounting
Internal Revenue Service
- Gerard J. O'Connell, Jr., J.D.**
Finance
Honeywell Information Systems
- Daniel F. O'Connor, M.S.***
Information Systems
Nixdorf Computer Corp

*Denotes senior lecturer as of October 1985.

Edward J. O'Connor, B.A.
Information Systems
Stop & Shop Co., Inc.

Aileen J. Ofer, M.A.*
English

George C. O'Grady, B.A.
Information Systems
Digital Equipment Corp.

Joseph A. O'Keefe, M.Ed.
Law Enforcement
Dept. of Public Safety

Sherri L. Oken, M.S.
Alt. Freshman/Language Skills
Northeastern University

Marta Rosso O'Laughlin, M.A.
Modern Language

William J. Oldmixon, M.B.A.
Finance
Prudential Bache Securities

Russell W. Olive, D.B.A.
Industrial Management
Northeastern University

Ernest Oliveira, Jr., M.B.A.*
Industrial Management
General Electric Company

Jon N. Oliver, M.A.
Therapeutic Recreation
Creative Education Associates

Wayne J. Oliver, M.A.*
Economics
R. J. Ridding Associates

Mary H. O'Loughlin, B.S.
Radiologic Technology
Cardinal Cushing General Hospital

Gerald F. Olsen, M.B.A.
Accounting
Digital Equipment Corp.

George C. Olson, M.B.A.*
Information Systems
Union Warren Savings Bank

Kirtland H. Olson, M.A.
Technical Communications
The Harvard Group

Ronald K. Olson, B.A.
Information Systems
Prime Computer, Inc.

Tommasina A. Olson, M.B.A.
Management
F. Detwiler & Co., Inc.

Jeffrey Olund, M.S.
Alt. Freshman/English

David F. O'Malley, B.S.
Technical Communications
Harper & Shuman Financial

David S. Omar, M.Ed.*
Economics

James W. O'Neil, A.B.*
Law Enforcement
Security Consultant

Dorothy M. Oppenheim, M.B.A.
Management
Northeastern University

Nancy P. Orton, B.A.
English

George J. O'Shea, Jr., M.S.W
Law Enforcement
Division of Youth Services

Richard H. O'Shea, M.P.A.
Law Enforcement
N.H. Dept. of Education

Gary S. Osmond, M.B.A.
Finance
Raytheon Company

Robert E. O'Toole, M.S.W.
Health Management
Oakdale Counseling & Training

Linda C. Ott, M.A.
Music

Susan M. Ott, Ph.D.
Psychology
Fernald State School

Albert J. Ottariano, M.B.A.*
Economics

John B. Owen, M.A.T.
Technical Communications
Haemonetics

Daniel J. Pagnano, Esq., J.D.
Human Resources Management
Boston School Committee

Richard W. Paine, Ph.D.*
Psychology
Harvard University

Elaine Palome, B.S.
Biology
Northeastern University

Judith A. Palumbo, M.B.A.
Human Resources Management
Massachusetts Hospital Association

Dawn M. Pandolf, A.S.
Radiologic Technology
Faulkner Hospital

Anil M. Pandya, D.B.A.
Marketing
Northeastern University

George Papatsores, B.S.
Alt. Freshman/Mathematics

Neeta V. Parekh, M.A.
Economics
Northeastern University

Judith M. Pariseau, B.S.
Biology
Northeastern University

Robert A. Parsons, M.B.A.
Management Sciences
Northeastern University

Virginia C. Parsons, M.A.
English
Northeastern University

S. Jack Pashoogian, B.S.
Mathematics
Massachusetts AMC

Paul S. Paslaski, M.B.A.
Information Systems
Digital Equipment Corp.

Herbert S. Patchell, M.A.
Philosophy/Religion

Theodore C. Patrikas, B.S.*
Management

David F. Pauling, M.A.*
Modern Language

Susan W. Pease, B.A.
Technical Communications
Self-Employed

Joseph C. Pedula, B.S.*
Human Resources Management
The Gillette Company

Robert A. Pelletier, B.S.
Information Systems
Damon Corp.

Martin L. Pendleton, Jr., B.S.*
Information Systems
Agency Management Systems

Carroll E. Pennell II, M.A.I., M.B.A.*
Real Estate
C. W. Whittier & Brother

Sallyann Penta, M.B.A.
Accounting
Towle Manufacturing

Timothy P. Perkins, M.A.
English
Boston University

William K. Perkins, B.S.E.E.
Technical Communications
Codex Corp.

Harry J. Perreault, B.S.
Information Systems
Liberty Mutual Insurance Co.

Richard A. Perrin, M.B.A.
Information Systems
Massachusetts General Hospital

Peter E. Perroncello, M.S.
Law Enforcement
Norfolk County Sheriff Dept.

Eileen C. Perry, B.S.
Medical Laboratory Science
Laboure College

Daniel Pershonok, Ph.D.*
Psychology
Harvard Medical School

Stuart S. Peterfreund, Ph.D.
English
Northeastern University

Daniel P. Petinge, M.B.A.
Purchasing
Polaroid Corp.

Ausrele M. Petronis, M.Ed.*
English
Shuman & Lubets Associates

Carol A. Pharo, M.A.
Music

Marie J. Philip, B.A.*
American Sign Language
Northeastern University

Peter T. Philliou, Ph.D.*
Mathematics
Wentworth Institute

Robert E. Piecewicz, M.S.
Information Systems
American Mutual Liability Ins.

William B. Pierce, M.B.A.
Finance
Cape Cod Community College

Benjamin E. Pike, M.B.A.*
Human Resources Management
Massasoit Community College

Joseph G. Pike, M.A.
Health Record Administration
The Arbour Hospital

Karen F. Pike, M.Ed.*
Art

Gerald T. Pineault, M.B.A.*
Industrial Management
Polaroid Corp.

Robert E. Pino, B.S.
Law Enforcement
Commonwealth of Massachusetts

*Denotes senior lecturer as of October 1985.

Garth I. Pitman, Ph.D.*

English
Trident Regional High School

Carmen S. Pizzuto, Ph.D.*

Law Enforcement
Department of Youth Services

Stephany A. Plsek, M.A.

Music
Berklee College of Music

Kevin M. Plunkett, Ph.D.

Alt. Freshman/English

Karen L. Pokross, M.Ed.

Therapeutic Recreation
Veterans Administration

Gladys M. Polansky, M.A.*

English

Terry L. Poling, M.A.

Speech Communication
Codex Corp.

John J. Pollock, A.B.

Marketing

Jonathan D. Pond, D.B.A.

Accounting

Charles J. Porfert, M.S.

Security
U.S. Environ. Protection Agency

John D. Post, Ph.D.*

History
Northeastern University

Joseph L. Potts, M.B.A.

Finance
Capital Business Group

James E. Poulos, M.A.*

English

Stephen J. Powell, M.B.A.

Finance
Instrumentation Lab., Inc.

Edward J. Powers, M.B.A.*

Industrial Management
Self-Employed

Elizabeth J. Powers, B.S.

Information Systems
Raytheon Company

Stephen J. Powers, M.S.

Information Systems
Cadesone Data

Richard A. Pozniak, B.S.

Marketing
Massachusetts Hospital Association

Michael J. Princi, J.D.

Law Enforcement
Garnick & Princi, P.C.

Alfred Prokop, M.S.

Medical Laboratory Science
Gibco Laboratories

Therese A. Provenzano, M.A.

Music

Edward V. Puopolo, J.D.*

Business Law
Puopolo & Carr, Attorneys

Carlton Purcell, M.B.A.

Information Systems
Purcell and Associates

Armand G. Qualliotine, M.A.

Music

Jane Woodbury Quinlan, M.A.

Nursing
Visiting Nurse Association

Daniel F. Quinn, M.A.

Information Systems
Northeastern University

Frank B. Quirk, M.A.

Information Systems
BayBanks Systems, Inc.

Leslie S. Radcliffe, M.A.

Technical Communications
Self-Employed

Alan S. Radding, M.S.

Journalism
Tunnel Radio

Hugh P. Rafferty, M.A.

Law Enforcement
Acme Marble and Granite Co.

James M. Ragsdale, B.A.

Journalism
The Standard Times

Malati Ramratnam, Ph.D.

English

Lewis M. Randa, M.A.

Therapeutic Recreation
Life Experience School

Carla A. Ratti, M.S.

Psychology
Northeastern University

Nathaniel C. Raymond, Ph.D.*

Sociology/Anthropology
U. Mass/Boston

Bernard R. Redgate, M.S.

Information Systems
Framingham Public Schools

Eric T. Reenstierna, B.A.

Real Estate
T. H. Reenstierna & Sons

Denis G. Regan, Esq., J.D.*

Business Law
Self-Employed

Richard M. Regan, LL.B.*

Human Resources Management
State Street Bank & Trust

William M. Reiff, Ph.D.

Chemistry
Northeastern University

Richard M. Reilly, M.A.

Human Resources Management
American Arbitration Assoc.

Barbara W. Reitz, M.B.A.

Management

Christine Rhodes, M.S.

English
Michael T. Rhodes, M.A.

Therapeutic Recreation
Braintree Hospital

Sara S. Rhodes, B.A.

Health Science

Evan B. Rich, M.B.A.

Finance
Stone & Webster Eng. Corp.

Herbert L. Richmond, C.A.G.S.

Health Management
Area II Homecare Senior Citizens

Mary E. Ridge, M.P.A.

Law Enforcement

Stephen L. Ridge, M.B.A.

Accounting
Digital Equipment Corp.

Frederick W. Riley, J.D.*

Law Enforcement
Asst. Attorney General

J. Scott Riley, B.S.*

Marketing
JSR Associates, Inc.

William J. Riley, M.Ed.

Law Enforcement
Brookline Police Department

Mordechai Rimor, M.A.

Psychology
Northeastern University

Virginia C. Risse, M.Ed.

Sociology/Anthropology
Mass. Mental Health Center

Syed S. Rizavi, M.A.

Economics
Northeastern University

Daniel J. Roberts, M.Ed.

Accounting
Northeastern University

Frank M. Robinson, Jr., C.A.G.S.

Therapeutic Recreation
Northeastern University

Holbrook C. Robinson, Ph.D.

Modern Language
Northeastern University

Raymond H. Robinson, Ph.D.

History
Northeastern University

Cephas B. Rogers, M.B.A.*

Management Sciences
Digital Equipment Corp.

William H. Rogers, M.Ed.

Transportation
Wang Laboratories

Irene L. Roman, M.Ed.

Accounting
Newton North High School

Lawrence J. Romano, M.A.*

Modern Language
Charles Stark Draper Labs

Robert N. Romanowski, M.A.*

Law Enforcement
First Security Services

Fred A. Rosenberg, Ph.D.

Biology
Northeastern University

Joel M. Rosenfeld, M.S.*

Industrial Management
Strategic Planning Institute

Norma P. Rosin, M.Ed.

Alt. Freshman/Language Skills

Richard S. Ross, M.A.

Alt. Freshman/History
Northeastern University

Peter P. Rossi, M.B.A.

Finance
Bank of Boston

Robert J. Roth, B.A.*

Law Enforcement

Arthur S. Rousmaniere, B.A.

Mathematics
Digital Equipment Corp.

Gerald R. Rubin, B.S.*

Accounting
Greene Rubin & Miller

Louis Rudzinsky, B.S.*

Human Resources Management
Louis Rudzinsky Assoc., Inc.

*Denotes senior lecturer as of October 1985.

Nancy G. Rullo, M.B.A.

Finance

Frederick L. Runyon, B.F.A.

Art

Kathleen M. Russell, M.A.

Modern Language

Malden School Department

Thomas R. Rutishauser, B.S.

Music

Frank L. Ryan, Ph.D.*

English

Stonehill College

P. Barry Ryan, Ph.D.

Chemistry

Harvard School of Public Health

Charles M. Ryder, M.B.A.

Management

N.E. Mutual Life Ins. Co.

John D. Ryder, M.B.A.*

Accounting

Tyco Laboratories, Inc.

Frederick J. Rys, M.B.A.

Finance

New England Telephone Co.

Alexander R. Rysman, Ph.D.*

Sociology/Anthropology

Romm and Company

David J. Sack, B.S.*

Radiologic Technology

Brigham & Womens Hospital

Thaddeus P. Sadowski, M.Ed.*

Mathematics

North Quincy High School

Albert P. Sagansky, M.B.A.

Transportation

Self-Employed

Charles L. Sakey, M.A.*

English

Boston Latin School

Mary E. Salus, M.A.*

Sociology/Anthropology

Mass. Dept. of Public Welfare

James B. Sampson, Ph.D.*

Psychology

U.S. Army Research Institute

Richard P. Samuels, M.S.*

Mathematics

New England Telephone Co.

Paul E. Sanders, D.B.A.

Finance

Honeywell Information Systems

Jayant N. Sane, Ph.D.

Chemistry

The Gillette Company

Jean M. Sannicandro, B.A.

Mathematics

Northeastern University

Richard H. Saracusa, M.B.A.

Information Systems

Polaroid Corp.

Ahmad Saranjampour, M.A.

Economics

Northeastern University

Willis L. Saulnier, M.S.W.*

Human Resources Management

Creative Enterprises

Stephen R. Savage, M.B.A.

Art

Graphic Communications, Inc.

Eugene D. Savitt, M.S.A.

Health Science

Forsyth Dental Center

Eunice Schatz, M.A.

Women's Career Program

Life/Work Direction

Frank T. Schettino, M.S.

Law Enforcement

Northeastern University

Donald S. Scheufele, Ph.D.

Chemistry

Boston Public Schools

John J. Schickling, M.B.A.*

Accounting

Self-Employed

William J. Schmid, B.S.

Marketing

Mark B. Schmidt, J.D.

Real Estate

Commonwealth of Massachusetts

Diane R. Schodlatz, Ed.D.

Psychology

Judge Baker Guidance Center

Roy M. Schoenfeld, Esq., J.D.*

Human Resources Management

Natl. Labor Relations Board

Harry G. Schortmann, Jr., M.B.A.

Management

Richard Schreuer, M.A.

Sociology/Anthropology

Northeastern University

Lucy J. Schuman, B.S.

Health Science

Randolph School

Alan R. Schwalm, B.S.

Finance

Multibank Financial Corp.

Daniel C. Scioletti, Jr., M.S.

Accounting

EG&G, Inc.

Frank J. Seegraber, A.B.*

Library Science

Boston College

Jeanne M. Segal, M.A.

Music

Self-Employed

Harvey J. Segall, A.S.

Journalism

Harvey J. Segall Photography

Mary K. Seipke, M.F.A.

Art

Self-Employed

Peter M. Selig, M.A.*

Economics

Raytheon Company

J. Thomas Selldorff, M.S.

Marketing

SCI, Inc.

Patricia C. Selleck, B.S.

Radiologic Technology

St. Anne's Hospital

Kathleen M. Sevigny, M.B.A.

Accounting

Bridgewater State College

John C. Shannon, M.A.*

Economics

Suffolk University

Robert J. Shannon, M.S.

Medical Laboratory Science

Boston VA Medical Center

Arthur Shaw, Ed.

Alt. Freshman/Mathematics

David M. Shaw, LL.M.

Real Estate

Law Office of David M. Shaw

Garrett M. Sheehan, M.S.

Law Enforcement

Lowell Police Department

Joseph R. Sheppeck, M.B.A.

Mathematics

John Hancock Life Insurance Co.

Eliot H. Sherman, M.B.A.

Finance

Pellon Corp.

Stephen M. Shinnick, M.P.A.

Political Science

Norwood Public Schools

Henrietta N. Shirk, Ph.D.

Technical Communications

Software International Corp.

Henrietta M. Shmase, B.A.

Health Record Administration

Northeastern University

Alan R. Shneider, M.B.A.*

Accounting

Self-Employed

Ruth E. Shore, M.A.*

English

Fisher Junior College

Paul M. Short, M.S.

Hotel & Restaurant Management

U.S. Army Research Center

Ronald A. Shulman, M.C.E.*

Marketing

Business Communications Center

Paul E. Shumsky, B.A.

Music

Stephanie Shute, M.A.

English

Westwood High School

Susan F. Sieloff, M.B.A.

Marketing

Andrew Silverman, M.S.

Accounting

Andrew Silverman, C.P.A.

George H. Simmons, Jr., M.A.

Economics

Dept. of Public Utilities

Michael L. Simmons, M.P.A.

Political Science

Commonwealth of Massachusetts

S. Murray Simons, M.B.A.*

Accounting

Greater Lynn Mental Health Ctr.

Carolyn M. Sirois, M.A.

Alt. Freshman/English

Berklee College of Music

Victoria R. Sirota, Ph.D.

Music

Lloyd A. Skiffington, Ph.D.*

English

Northeastern University

Vernon Skipper, B.S.

Management

The Boston Company

*Denotes senior lecturer as of October 1985.

Walter E. Skowronski

Finance
The Boston Company

Stephen E. Slaner, M.P.H.

Political Science
Northeastern University

Marjorie T. Slater, B.S.

Journalism
Self-Employed

Stephanie L. Small-Prasher, M.A.*

Sociology/Anthropology
Massasoit Community College

Charles Smigelski, R.D., B.S.

Health Science

Barbara A. Smith, M.A.

Psychology
Northeastern University

Donald O. Smith, Esq., J.D.

Business Law
Attorney at Law

Eileen Smith, B.S.

Alt. Freshman/Language Skills

Malcolm V. Smith, B.S.*

Mathematics
N.E. Mutual Life Ins. Co.

Mary A. Smith, M.A.

Sociology/Anthropology
Northeastern University

Peter H. Smith, M.B.A.

Accounting
Honeywell, Inc.

Robert W. Smith, B.S.

Human Resources Management
Northrop Corp.

Paul E. Snoonian, Sr., Ph.D.*

Economics
University of Lowell

Nancy P. Snyder, M.S.

Psychology
Northeastern University

Edward J. Socha, M.B.A.

Management
Assabet Valley Reg. Voc. H.S.

Harold P. Sock, Ed.D.

Women's Career Program
Gateway Counselling Services

Susan S. Sock, M.Ed.

Women's Career Program
Mass. Bay Community College

Sulo A. Soini, M.B.A.

Industrial Management
Commonwealth of Massachusetts

Kenneth C. Solano, M.Ed.

Human Resources Management
Northeastern University

Eric L. Solomon, M.A.

Technical Communications

Ingrid Sonnichsen, M.A.

Drama
Northeastern University

George J. Soukaros, Ed.D.

English
Marlboro High School

Alvaro M. Sousa, B.S.

Management
N.E. Mutual Life Ins. Co.

Edward L. Sousa, M.Ed.

Information Systems
Northeastern University

Elliot Spector, Ph.D.

Law Enforcement
Northeastern University

Robert M. Spector, Ph.D.*

History
Worcester State College

John F. St. Cyr, LL.B.

Law Enforcement
District Court Justice

Peter A. Stabile, M.B.A.

Finance

George H. Stacey, Jr., M.B.A.*

Information Systems
Stacey Associates, Inc.

Lee B. Staebler, C.M.A., M.B.A.*

Accounting
U. Mass/Boston

Joseph V. Stanford, LL.B.*

Finance
Self-Employed

Roberta A. Stannard, B.F.A.

Art
Design Interaction

Ronald Stapleton, B.S.*

Law Enforcement
Boston Police Department

Steven A. Stargardter, M.A.

Alt. Freshman/History
Northeastern University

Alan E. Steinberg, J.D.*

Real Estate
Self-Employed

Lee J. Steingisser, M.D.

Health Science
M. Thornton Health Plan, Inc.

Stanley R. Stenbridge, Ph.D.

History
Northeastern University

Thomas J. Stockett, B.S.*

Human Resources Management

George L. Stockman, B.A.

Marketing
Stockman and Andrews, Inc.

Edmund L. Stoddard, M.S.*

English
Raytheon Company

Joseph F. Stoltz, Ph.D.*

Economics
U.S. Department of Labor

John W. Stout, M.A.*

Political Science
Roger Williams College

James J. Stratford, Jr., J.D.*

Law Enforcement
Attorney at Law

Walter D. Stringer, B.S.

Purchasing
Raytheon Company

Robert Sugar, M.H.A.

Health Management
Wellesley Manor Nursing Home

Edward Sulesky, J.D.*

Management
District Court of Concord

Albert W. Sullivan, J.D.*

Real Estate
U.S. Postal Service

Daniel P. Sullivan, M.B.A.

Economics
Transportation Systems Center

Jeremiah G. Sullivan, B.S.*

Information Systems
Digital Equipment Corp.

Jeremiah J. Sullivan, Jr., J.D.

Human Resources Management
Raytheon Company

John R. Sullivan, M.A.

English
Houghton Mifflin Company

Pamela E. Sullivan, H.S.D.

Art
Emerson Lane Fortuna Advertising

William G. Sullivan, B.A.

Journalism
The Patriot Ledger

Barbara S. Sunstein, M.Ed.

English
Rivier College

Joseph L. Supple, A.B.

Information Systems
Digital Equipment Corp.

Herbert L. Sussman, Ph.D.

English
Northeastern University

William R. Swartz, M.B.A.

Industrial Management
NCA Corp.

Joseph Sweeney, M.B.A.

Information Systems
Interactive Data Corp.

Richard D. Sweeney, B.A.

Marketing
Mini Warehousing, Inc.

Allen M. Swenson, M.B.A.*

Economics
Raytheon Company

Richard G. Swensson, Ph.D.

Psychology
Harvard Medical School

Lawrence E. Symington, Ph.D.*

Psychology
U.S. Army R&D Labs

Eli Szklanka, B.A.

Information Systems
The EDP Corp.

Ali Taaghol, M.S.

Chemistry
Northeastern University

Thomas J. Tagliamonte, M.B.A.

Management
N.E. Mutual Life Ins. Co.

Scott B. Taitel, M.B.A.

Finance
Intermetrics, Inc.

Hugh J. Talbot, M.P.A.*

Law Enforcement
Northeastern University

Debra J. Tanen, B.F.A.

Art
Communication Graphics

Daniel E. Tanguy, M.A.

Information Systems
Massachusetts General Hospital

Sumner B. Tapper, M.Ed.*

English
Stoughton High School

*Denotes senior lecturer as of October 1985.

- Margaret Tarr, M.S.**
Nursing
- Theodore A. Tasis, M.A.***
English
Raytheon Service Company
- Alan M. Tattle, M.Ed.***
Information Systems
Lynn School Department
- Gloria J. Taylor, M.A.**
Sociology/Anthropology
Commonwealth of Massachusetts
- Roger B. Taylor, Esq., M.A.**
Economics
Lesley College
- Paul H. Tedesco, Ph.D.***
History
Northeastern University
- Maurice Temple, M.S.***
Mathematics
Bunker Hill Community College
- Peter T. Tessicini, I.U.C., M.Ed.**
Law Enforcement
Tessicini Photography
- Norman R. Tessier, C.A.G.S.***
Accounting
Roxbury Community College
- Corey R. Tevan, D.F.A.**
Art
Self-Employed
- Alan P. Thayer, Esq., M.B.A.***
Economics
Boston College
- Emile F. Thibault, M.B.A.**
Information Systems
U.S. Dept. of Labor
- Lewis O. Thompson, M.B.A.**
Marketing
EG&G Corp.
- Wendy W. Thompson, M.L.***
History
Lexington Public Schools
- Robert M. Thornton, M.B.A.**
Accounting
Town of Norwood
- Bruce P. Tis, M.B.A.**
Information Systems
Digital Equipment Corp.
- Henry L. Tischler, Ph.D.***
Sociology/Anthropology
Framingham State College
- William T. Tita, D.B.A.**
Management
Northeastern University
- Mark W. Tobin, B.S.**
Health Management
Ellis Nursing Home
- Roy M. Tollefson, Ph.D.**
Political Science
- Warren C. Tomkiewicz, Jr., M.S.***
Earth Science
Boston University
- James M. Toomey, C.A.G.S.**
Law Enforcement
Massachusetts State Police
- Richard W. Torian, M.Ed.***
Mathematics
Ashland High School
- Bernard A. Torri, B.A.**
Management
Mount Ida College
- Frank M. Tortora, M.A.***
Economics
Northeastern University
- Karen L. Tosca, M.A.**
Mathematics
Westwood Public Schools
- Victor H. Tose, M.B.A.***
Accounting
Eastern Nazarene College
- Rosario J. Tosiello, Ph.D.***
History
Pine Manor College
- Alan Tosti, M.P.A.***
Political Science
Bank of Boston
- Lawrence E. Towle, M.B.A.**
Accounting
Digital Equipment Corp.
- Harvey L. Towvim, Esq., J.D.**
Business Law
Self-Employed
- Edward G. Trachtenberg, M.B.A.**
Information Systems
Raytheon Company
- Helen A. Tsiganou, M.A.**
Sociology/Anthropology
Northeastern University
- James D. Turley, Ed.D.***
English
Rhode Island College
- David W. Tutein, M.A.***
English
Northeastern University
- Theresa H. Twombly, M.A.***
Sociology/Anthropology
- John K. Tyson, B.A.**
Music
- Philip A. Vaccaro, Ph.D.**
Management Sciences
Salem State College
- Paul T. Vaitkus, M.D.**
Health Science
Boston VA Medical Center
- Donat A. Valcourt, B.S.**
Information Systems
Milbrook Distributors
- Ivan B. Vandeworkeen, M.S.**
Chemistry
Westwood High School
- Marion M. Vannostrand, M.L.S.**
Alt. Freshman/English
- Constantine C. V. Varotsis, B.S.**
Chemistry
Northeastern University
- Marie Vartanian, M.A.**
Health Science
Leonard Morse Hospital
- Harvey Vetstein, C.A.G.S.***
English
Northeastern University
- Robert A. Vinson, M.A.***
Economics
Commonwealth of Massachusetts
- Robert F. Vitale, M.B.A.***
Information Systems
N. American Sales Division
- Philip M. Vitt, M.A.***
Law Enforcement
Boston Police Department
- Paula M. Vosburgh, M.S.**
Health Science
Northeastern University
- Sandra A. Waddock, D.B.A.**
Accounting
Northeastern University
- John M. Waggoner, M.A.**
English
- Jeffrey L. Wain, M.S.**
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NORTHEASTERN UNIVERSITY

Boston
Massachusetts

Scale 0 100 200

A

B

C

D

E

F

Academic and Service Buildings

Key

- B** African-American Institute (AF)
C Barletta Natatorium (BN)
DE Boston YMCA (BY)
C Cabot Physical Education Building (CB)
C Cahners Hall (CA)
B Cargill Hall (CG)
C Churchill Hall (CH)
D 716 Columbus Avenue (CP)
DE Cullinane Hall (Botolph) (CN)
C Cushing Hall (CU)
C Dana Research Center (DA)
B Dockser Hall (DK)
D Dodge Library (DG)
D Eli Student Building (Auditorium) (EL)
D Eli Student Center (Student Lounge) (EC)
C Forsyth Building (FR)
C Forsyth Building Annex (FA)
C Hayden Hall (HA)
A Hillel-Frager (HF)
B Holmes Hall (HO)
F 236 Huntington Avenue (HU)
E 271 Huntington Plaza (HN)

- DE** Hurtig Hall (HT)
B Kariotis Hall (KA)
C Kerr Hall (Faculty Center) (KA)
B Knowles Center (Gryzmish Hall) (KG)
B Knowles Center (Volpe Hall) (KV)
B Lake Hall (LA)
F 334 Massachusetts Avenue
F Matthews Arena (MA)
EF Matthews Arena Annex (MX)
B Meserve Hall (ME)
D Mugar Life Science Building
 (Peabody Health Professions Center) (MU)
D Nightingale Hall (NI)
B Parker Building (PA)
D Peabody Center
C Richards Hall (RI)
D Robinson Hall (RB)
AB Ruggles (11 Leon Street) (RU)
C Snell Engineering Center (SN)
D 122 St. Stephen Street (SS)
B Stearns Center (ST)
A 26 Tavern Road (TA)

Academic, Residential,
and Service Buildings

Handicapped Parking

Handicapped Routes

Parking Areas

Public Buildings

Public Parks

Street Direction

Underground Tunnel

Maps are provided by the
 Visitor Information Center
 115 Richards Hall, extension 2736.
 Some buildings on this map are used but
 not owned by Northeastern University.
 NUP 6.1.5



Belmont High School
221 Concord Avenue



Brockton High School
470 Forest Avenue

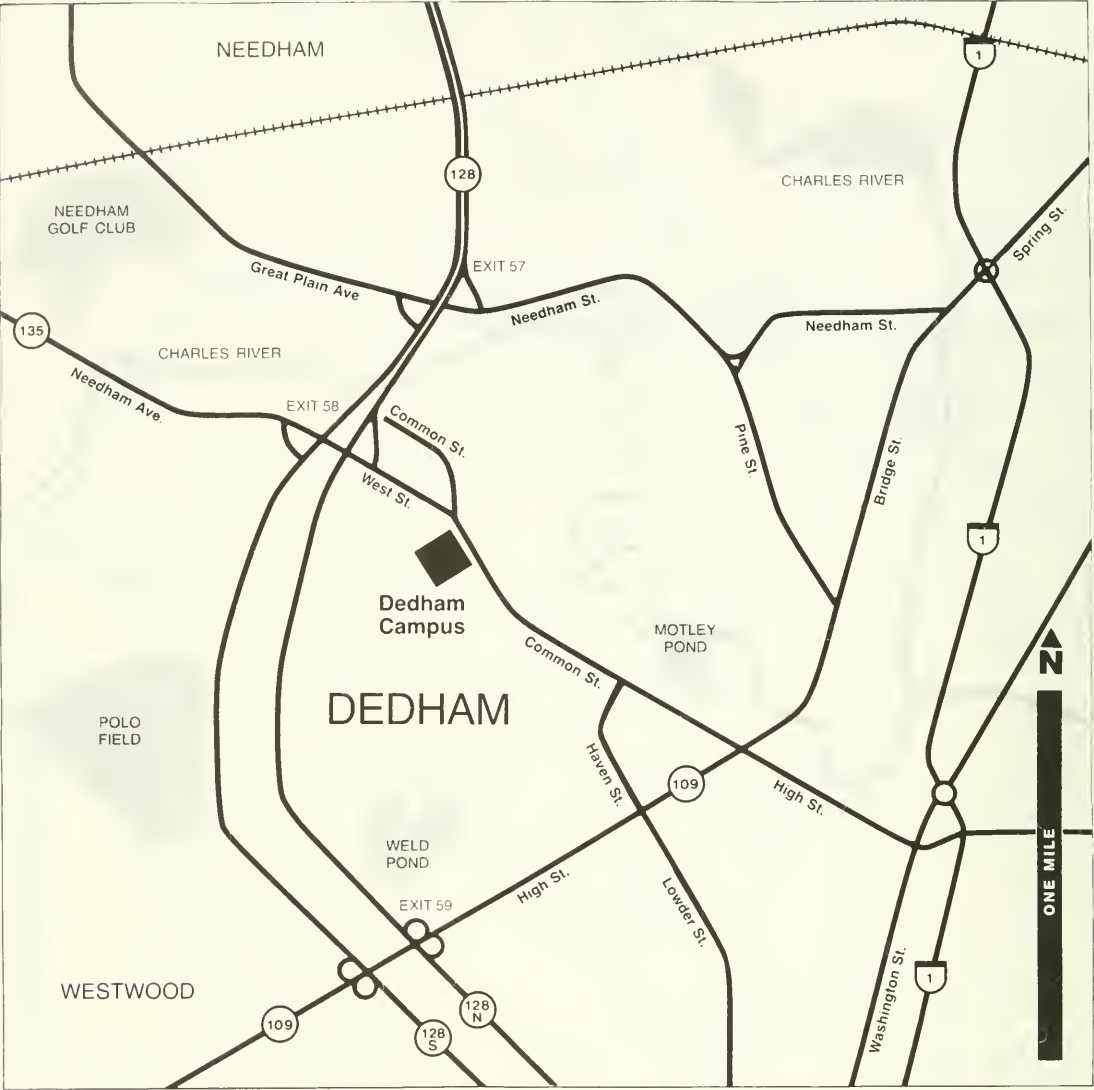


Burlington Campus
South Bedford Road

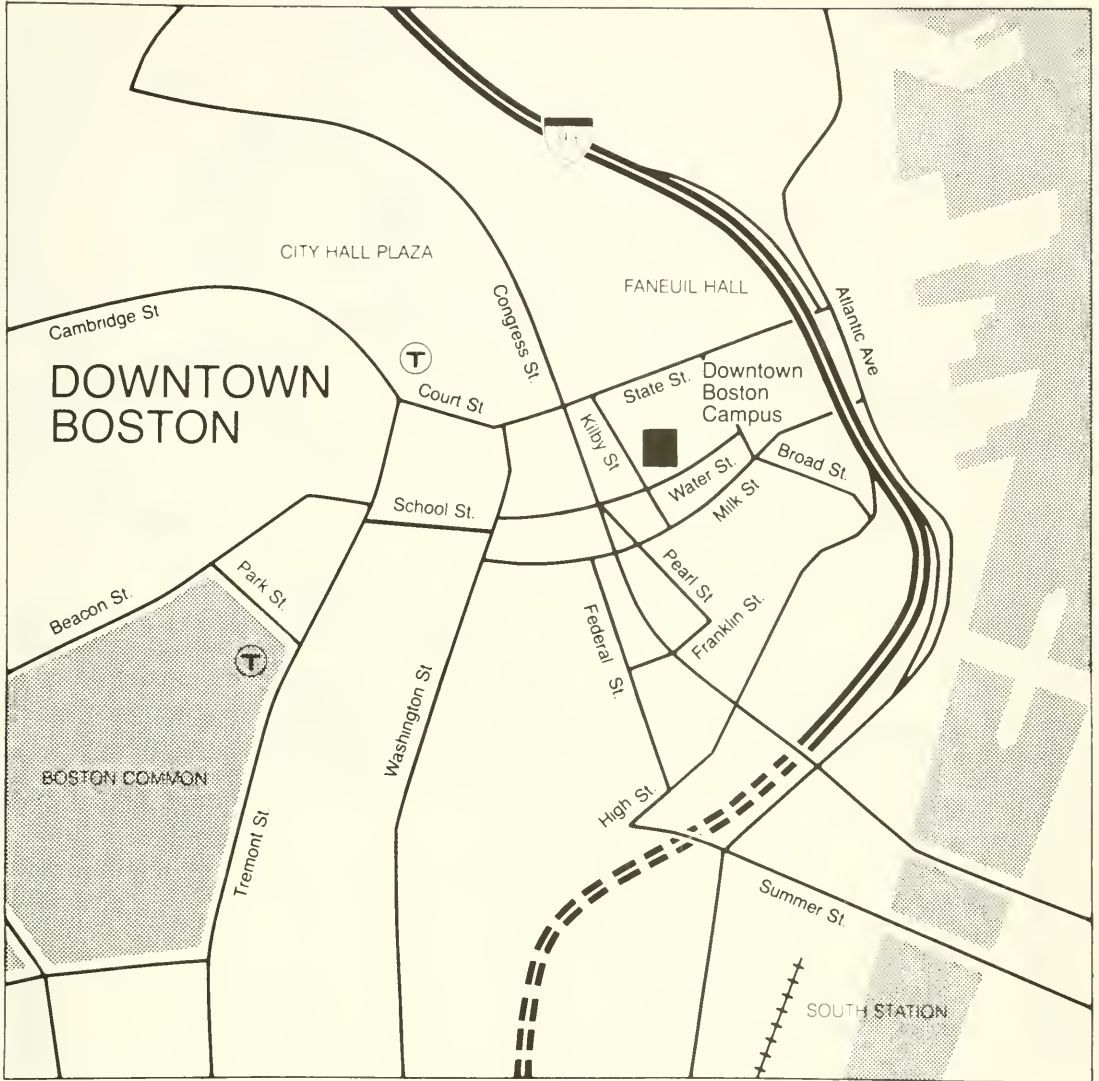
Burlington High School
123 Cambridge Street



Chelmsford High School
200 Richardson Road



Dedham Campus
370 Common Street

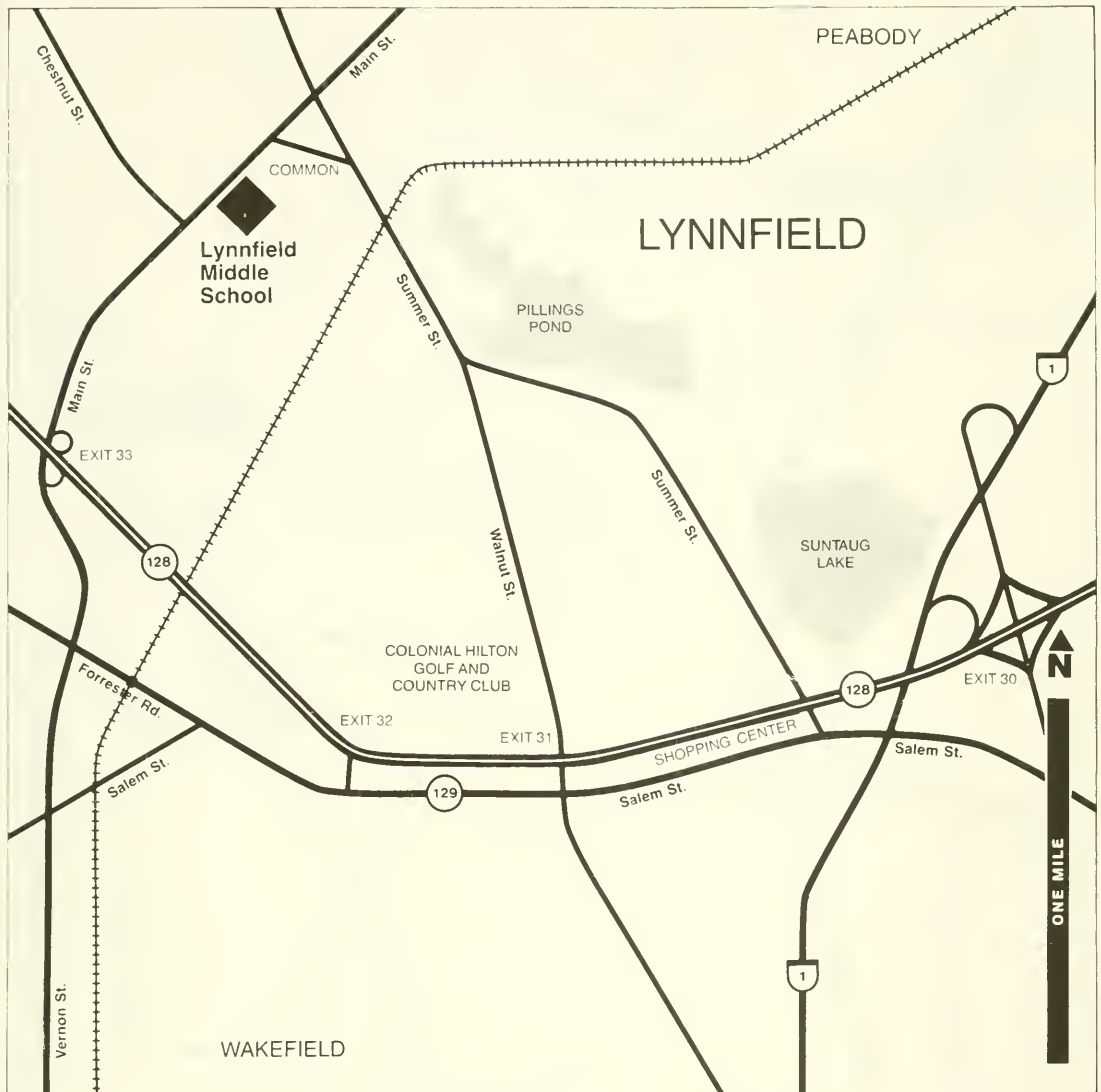


Downtown Boston Campus

5 Liberty Square



Framingham North High School
A Street

**Lynnfield Middle School**

505 Main Street



Marlboro High School
Bolton Street



Marshfield High School
Forest Street



Milford High School
31 West Fountain Street



Revere High School
101 School Street



Westwood High School

200 Nahatan Street



Weymouth North High School

1051 Commercial Street

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Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere, and the most congenial conditions it can provide. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern, and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Antidiscrimination Policy

Northeastern University is committed to a policy of equal opportunity to all students and employees without regard to race, color, religion, sex, sexual preference, national origin, or handicap or veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance.

Equal Opportunity Employment Policy

Northeastern University is an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, sex, age, sexual preference, national origin, or handicap or veteran status.

Northeastern University also prohibits discrimination against any employee regarding upgrading, demotion or transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training. In addition, the University adheres to Affirmative Action guidelines in all recruitment endeavors.

Further, Northeastern will not condone any form of sexual harassment, which is defined as the use of unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature as an explicit or implicit condition of employment, as the basis for employment decisions, or when such conduct interferes with an individual's work performance by creating an intimidating, hostile, or offensive work environment.

Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of the Rehabilitation Act of 1973, Affirmative Action Office, 175 Richards Hall, 617-437-2133.

Office of Services for the Handicapped

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Rehabilitation Act of 1973 are coordinated by Ruth Bork, OSH director, 5 Ell Center, 617-437-2675.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registrations of University College and the graduate schools.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), WRKO (680), and FM stations WBCN (104.1), and WROR (98.5) are authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

Disclaimer

Tuition rates, all fees, rules and regulations, and courses and course content are subject to revision by the President and the Board of Trustees at any time.

Accreditation

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators. The undergraduate business programs offered by Northeastern University are accredited by the American Assembly of Collegiate Schools of Business.

International Mission Statement

Northeastern University, a world leader in cooperative education, acknowledges the increasing interdependence among nations and therefore identifies its mission as preparing its graduates to live and work in an interdependent world. To accomplish this goal, the University actively seeks qualified students from abroad to enroll in its undergraduate and graduate programs in such numbers and with such geographic origins so as to create and foster a truly global exchange of ideas and values among students, faculty, and staff. The University also encourages all colleges to continually develop and expand course offerings to include international issues and cross-cultural aspects and supports faculty to teach and conduct research in the interrelationship among nations and peoples. In addition, the University promotes international understanding and the sharing of ideas with institutions throughout the world by virtue of its faculty and staff exchanges and its study and work-abroad programs for students.



1986–1987
Northeastern University

Basic Day Colleges
Course Descriptions and Curriculum Guide





Northeastern University 1986-1987

Basic Day Colleges Course Descriptions and Curriculum Guide

College of Arts and Sciences

Boston-Bouvé College

of Human Development Professions

College of Business Administration

College of Computer Science

College of Criminal Justice

College of Engineering

School of Engineering Technology

College of Nursing

College of Pharmacy and

Allied Health Professions

University College Alternative

Freshman-Year Program

Northeastern University charges tuition for all courses taken above the normal academic load.

The University reserves the right to make changes at any time in tuition rates, all fees, rules and regulations, and courses and course content announced in this bulletin.

Antidiscrimination Policy

Northeastern University is committed to a policy of equal opportunity for all students and employees without regard to race, color, religion, sex, sexual preference, national origin, or handicap or veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance.

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Further, Northeastern will not condone any forms of sexual harassment which is defined as the use of unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature: as an explicit or implicit condition of employment, as the basis for employment decisions or to interfere with an individual's work performance by creating an intimidating, hostile, or offensive work environment.

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Accreditation Statement

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Children's Center

Northeastern University operates a Children's Center in 123 Forsyth Building. The Center is academically housed in the Boston-Bouvé College of Human Development Professions' Department of Curriculum and Instruction. Children from age 2 years and 9 months to 6 years are eligible. For further information, phone 617-437-3929.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

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College of Arts and Sciences

The College of Arts and Sciences offers degree programs in 21 majors. In most majors, two degrees are offered: the Bachelor of Arts and the Bachelor of Science. Requirements for the degree options in each major are listed on the following pages. In addition to these requirements specified by the major department, the college has established certain minimum graduation requirements for its students. They are:

Quantitative: Candidates for either the Bachelor of Arts or Bachelor of Science degree must successfully complete 176 quarter hours of credit, 32 quarter hours of which need not be Arts and Sciences courses. In addition, only four quarter hours of Physical Education and no ROTC credits may be used to meet this requirement.

Residency: Candidates must complete either 75 percent of the degree credit (132 quarter hours) or the last three full quarters (a minimum of twelve four-credit courses) at Northeastern.

Qualitative: Candidates must achieve a minimum cumulative average of 2.0 (grade of C).

Other College Degree Requirements

The Core Curriculum

The College of Arts and Sciences Core Curriculum is a set of requirements intended to provide students with the opportunity to gain the broad base of knowledge traditionally associated with a liberal arts education. The Core gives you the opportunity to develop proficiency in basic skills; to be exposed to methods of analysis in the various subjects and disciplines in the arts and humanities, the social sciences, and the natural sciences and mathematics; and to become acquainted with ideas in Western culture, differing views in non-Western cultures, and major issues and problems facing contemporary society.

The Core Curriculum consists of six categories.

Category I Basic Skills:

- Freshman English (two or three courses)
- College Mathematics
- Modern Language (required of all B.A. candidates)

For placement information on Freshman English, College Mathematics, or Modern Languages, students should consult the Dean's Office (400 Meserve Hall) or the appropriate department. Placement criteria are published in *The College of Arts and Sciences Student Guidebook* and the *Core Curriculum Guidebook*.

Category II Methods of Inquiry

Category III The Western Cultural Heritage

Category IV Alternative Cultures and Societies

Category V Theoretical Perspectives and Changes

Category VI Current Issues in Perspective

Students are required to complete courses in each category of the Core, depending upon the major and degree pursued. *The Core Curriculum Guidebook*, available in the Dean's Office, provides a thorough description of the courses required in each category, as well as a list of courses that may be used to fulfill each requirement. Roman numerals at the end of course descriptions in the following pages also indicate Core courses for each category.

*NOTE: The Core Curriculum is required of all students who entered the College as freshmen in or after the fall of 1984 and all transfer students who entered the College in or after the fall of 1985. Students who entered prior to these dates complete a Distribution Requirement (B.A. candidates only) and Freshman English. For more specific information on the Distribution Requirement, consult the Dean's Office (400 Meserve Hall) or previous editions of the *Course Description and Curriculum Guide*.

Middler Year Writing Requirement

The Middler Year Writing Requirement (MYWR) is an all-University requirement affecting freshmen who entered the University in or after the fall of 1984 and transfer students who entered the University in or after the fall of 1985.

College of Arts and Sciences strongly recommends Intermediate Writing (ENG 1350) to complete the Middler Year Writing Requirement. Students may, however, also satisfy the requirement by taking a four-credit writing course from the approved MYWR list or, with special permission through the petition process, a one-credit Writing Workshop (ENG 1340).

College Honors Program

The College of Arts and Sciences Honors Program runs Honors sections of some required or elective courses, as well as some interdisciplinary Honors seminars and minicourses. Many of these courses are equivalent to standard courses in the College for satisfaction of degree requirements. Their numbering is designed to make this apparent. For example, an Honors section of ECN 1115 will be numbered ECN 1715; PHL 1100 is PHL 1700. A full list of the offerings can be found in each quarter's booklet of course offerings, listed under the departments that offer the courses, and identified with a 1700 number.

For more information on Honors courses, how to qualify to take courses, and other aspects of the program, contact the Honors Program office at 437-2333 or drop by 213 Lake Hall.

STUDENTS SHOULD REFER TO *THE COLLEGE OF ARTS AND SCIENCES STUDENT GUIDEBOOK*, *THE CORE CURRICULUM GUIDEBOOK*, AND ANY PUBLICATIONS DISTRIBUTED BY MAJOR DEPARTMENTS FOR MORE SPECIFIC INFORMATION ABOUT THE CURRICULUM.

African-American Studies

Bachelor of Arts Bachelor of Science

A major in African-American Studies offers background for a wide range of professions calling for understanding of intergroup relations and the minority experience. Students may go on to graduate study in such areas as social work, sociology, education, law, business, history, or the humanities.

Students majoring in African-American Studies may earn either the Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) degree. All majors are required to take the following set of courses.

- AFR 1127 African-American Literature
- AFR 1131 African-American History I
- AFR 1161 Economic Issues in Minority Communities
- AFR 1171 Survey of Contemporary Black Political Movements
- AFR 1240 Contemporary Issues in Black Society
- AFR 1248 Race Relations in America
- AFR 1280 Black Psychological Identity
- AFR 1300 Directed Study
- AFR 1350 Research Seminar

Faculty advisers work with students to help them select one or more "concentration clusters" (as described below) in African-American Studies.

Minor in African-American Studies

A minor in African-American Studies is designed to meet the needs of students who major in other areas but have special interest in African-American Studies. To qualify for a minor, a student must earn 28 quarter-hour credits in the field, 12 of which must be from the set of courses required for majors. The remaining credits will be a concentration cluster arranged in consultation with a student's faculty adviser.

A concentration cluster is a set of four courses that focuses on a given aspect of African-American Studies. A cluster might focus on sociology-psychology, history, humanities, human service, research, or other areas related to the student's educational or career needs. Concentration clusters are arranged in consultations between the student and a faculty adviser.

Art and Architecture

Bachelor of Arts Bachelor of Science

Major in Art: ART 1100, History of Art to 1400, and ART 1101, History of Art since 1400; twelve art electives; one music elective, one theatre and dance elective; and one elective from history, psychology, or philosophy.

Studio Art Concentration. Same requirements as for the art major, except for the art electives, which are substituted by ten studio courses (ART 1124, Basic Drawing; ART 1127, Basic Painting; ART 1130, Foundations of Visual Design; ART 1132, Graphic Design I; ART 1138, Introduction to Printmaking; ART 1160,

Basic Photography I; ART 1170, Filmmaking Workshop; ART 1250, Color Theory and Practice; ART 1254, Intermediate Drawing; and ART 1261, Basic Photography II), and four art history courses (ART 1213, Modern Painting; ART 1230, History of Photography; or ART 1233, Contemporary Directions in Photography; ART 1235, History of Film; or ART 1236, The American Film; and ART 1240, History of Graphic Design).

History of Art and Architecture Concentration. Same requirements as for the art major, except for the art electives, which are substituted by eight history of art and architecture courses (ART 1200, Ancient Art and Architecture; or ART 1203, Medieval Art and Architecture; ART 1204, Renaissance Art and Architecture; ART 1210, French Painting; ART 1213, Modern Painting; ART 1220, American Sculpture and Painting; or ART 1223, American Architecture; ART 1228, Contemporary Architecture and the City; ART 1230, History of Photography; or ART 1233, Contemporary Directions in Photography; and ART 1235, History of Film; or ART 1236, The American Film; or ART 1237, Contemporary Directions in Cinema), and six studio courses (ART 1124, Basic Drawing; ART 1127, Basic Painting; ART 1130, Foundations of Visual Design; ART 1150, Introduction to Architectural Design; ART 1160, Basic Photography I; and ART 1250, Color Theory and Practice).

Architecture Concentration. In collaboration with the Boston Architectural Center and leading to a Bachelor of Science degree (a preprofessional degree). Same requirements as for the art major, except for the art electives, which are substituted by six architectural history courses (ART 1111, Introduction to Architecture; ART 1200, Ancient Art and Architecture; or ART 1203, Medieval Art and Architecture; ART 1204, Renaissance Art and Architecture; ART 1223, American Architecture; ART 1225, Technology, Architecture, and the City; and ART 1228, Contemporary Architecture and the City); four studio courses (ART 1150, Introduction to Architectural Design; ART 1124, Basic Drawing; ART 1130, Foundation of Visual Design; and ART 1132, Graphic Design I); five math/science courses (MTH 1123, Calculus; MTH 1124, Calculus; PHY 1221, Physics for Engineers I; PHY 1222, Physics for Engineers II; and one computer science elective); and five studio and four technical courses offered at the Boston Architectural Center.

Minors in Art

History of Architecture: ART 1111, History of Architecture; ART 1150, Introduction to Architectural Design; ART 1113, Architecture and the City; ART 1223, American Architecture; ART 1225, Technology, Architecture, and the City; and ART 1228, Contemporary Architecture and the City.

History of Art: ART 1200, Ancient Art and Architecture; ART 1203, Medieval Art and Architecture; ART 1204, Renaissance Art and Architecture; ART 1210, French Painting; ART 1213, Modern Painting; and ART 1220, American Sculpture and Painting.

Studio Art: ART 1124, Basic Drawing; ART 1127, Basic Painting; ART 1130, Foundations of Visual Design; ART 1132, Graphic Design I; ART 1138, Introduction to Printmaking; and ART 1243, Graphic Design II or ART 1254, Intermediate Drawing.

Photography: ART 1160, Basic Photography I; ART 1261, Basic Photography II; ART 1230, History of Photography; ART 1233, Contemporary Directions in Photography; ART 1263, Introduction to Color Photography; and ART 1363, Intermediate Photography Workshop.

General Minor: Selection of any six courses from the departmental curriculum.

Biology

Bachelor of Arts

BIO 1103, Principles of Biology I; BIO 1104, Principles of Biology II; BIO 1105, Principles of Biology III; BIO 1211, Environmental and Population Biology; BIO 1260, Genetics and Developmental Biology; BIO 1261, Cell Physiology and Biochemistry; and four advanced biology electives approved by department Advisory Committee.

MTH 1106, MTH 1107, or Calculus (one year); PHY 1201, PHY 1202, Physics for the Life Sciences I and II, PHY 1501, PHY 1502, Physics Laboratory for the Life Sciences I and II; or PHY 1231, Physics for Science Majors I; and PHY 1232, Physics for Science Majors II, or PHY 1233, Physics for Science Majors III; PHY 1531, PHY 1533, or PHY 1532, Physics Laboratory for Science Majors I and II or III; CHM 1111, General Chemistry; CHM 1122, General Chemistry II; CHM 1221, Analytical Chemistry; CHM 1264, CHM 1265, Organic Chemistry I and II.

Bachelor of Science

BIO 1103, Principles of Biology I; BIO 1104, Principles of Biology II; BIO 1105, Principles of Biology III; BIO 1211, Environmental and Population Biology; BIO 1260, Genetics and Developmental Biology; BIO 1261, Cell Physiology and Biochemistry; BIO 1490, Senior Seminar; four advanced biology electives approved by department Advisory Committee.

Calculus (one year); PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III; PHY 1531, PHY 1532, Physics Laboratory for Science Majors I and II; or PHY 1533, Physics Laboratory for Science Majors III; CHM 1111, General Chemistry; CHM 1122, General Chemistry II; CHM 1221, Analytical Chemistry; CHM 1264, CHM 1265, Organic Chemistry I and II; two additional advanced science electives approved by the Departmental Advisory Committee.

Foreign language requirement.

Chemistry

Bachelor of Arts

CHM 1151, CHM 1152, General Chemistry for Science Majors I and II; CHM 1153, The Chemical Elements; CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors and Chemical Engineering Students I, II, and III; CHM 1381, CHM 1382, CHM 1383, Physical Chemistry I, II, and III; CHM 1394, CHM 1395, CHM 1396, Experimental Physical Chemistry I, II, and III; CHM 1431, Instrumental Analysis.

MTH 1143, MTH 1144, MTH 1145, Calculus I, II, and III; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III; PHY 1532, PHY 1533, Physics Laboratory for Science Majors II and III.

Bachelor of Science

CHM 1151, CHM 1152, General Chemistry for Science Majors I and II; CHM 1153, The Chemical Elements; CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors and Chemical Engineering Students I, II, and III; CHM 1381, CHM 1382, CHM 1383, Physical Chemistry I, II, and III; CHM 1394, CHM 1395, CHM 1396, Experimental Physical Chemistry I, II, and III; CHM 1431, Instrumental Analysis; CHM 1441, Inorganic Chemistry; CHM 1461, Identification of Organic Compounds; two advanced science or mathematics electives; one advanced laboratory.

MTH 1143, MTH 1144, MTH 1145, Calculus I, II, and III; MTH 1243, Calculus and Linear Methods I, or MTH 1223, Calculus. MTH 1245, Differential Equations and Linear Methods I; or MTH 1225, Mathematical Analysis; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III; PHY 1532, PHY 1533, Physics Laboratory for Science Majors II and III.

Minor in Chemistry

After a general chemistry sequence, CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry I, II, and III for Chemistry Majors and Chemical Engineering Students; CHM 1381, CHM 1382, Physical Chemistry I, II. CHM 1394, CHM 1395, Experimental Physical Chemistry I and II.

Economics

Bachelor of Arts

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1250, ECN 1251, Statistics I and II; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; six economics electives.

MTH 1106, MTH 1107, Fundamentals of Mathematics I and II; four social science electives other than economics.

Bachelor of Science

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1250, ECN 1251, Statistics I and II; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; ECN 1350, Introduction to Econometrics; or ECN 1351, Problems in Economic Research; ten economics electives.

MTH 1106, MTH 1107, Fundamentals of Mathematics I and II; four social science electives other than economics.

Minor in Economics

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; four electives in economics. Electives to be selected with the advice of a department adviser. Any course taken outside the Department of Economics to satisfy these economics elective requirements must be approved by a faculty adviser in the Department.

English

Bachelor of Arts

ENG 1126, Backgrounds to English and American Literature; ENG 1120 and 1121, Survey of English Literature I and II; ENG 1123 and 1124, Survey of American Literature I and II; ENG 1307, Approaches to Literature; two period courses; three major figure courses (one must be Shakespeare); one language or writing course; one junior-senior seminar; three electives in literary studies, literary periods, or language and writing.

Bachelor of Science

ENG 1126, Backgrounds to English and American Literature; ENG 1120 and 1121, Survey of English Literature I and II; ENG 1123 and 1124, Survey of American Literature I and II; ENG 1307, Approaches to Literature; two period courses; three major figure courses (one must be Shakespeare); one language or writing course; one junior-senior seminar; three electives in literary studies, literary periods, or language and writing.

Minor in Literature

Six courses required. Two survey courses required from the following: ENG 1120, Survey of English Literature I; ENG 1121, Survey of English Literature II; ENG 1123, Survey of American Literature I; ENG 1124, Survey of American Literature II. One course from each of the following categories: (a) literary periods; (b) major figures; and (c) language and writing. One elective from (a), (b), (c), or literary studies.

Minor in Writing

Six courses required. Two courses from: ENG 1350, Intermediate Writing; ENG 1351, Creative Writing; ENG 1125, Technical Writing I. Four courses from: ENG 1370, Technical Writing II; ENG 1371, Writing for the Computer Industry; ENG 1380, Writing for the Professions: Health Services; ENG 1352, Advanced Writing; ENG 1381, Writing for the Professions: Business Administration; ENG 1382, Writing for the Professions: Criminal Justice; ENG 1357, Poetry Workshop; ENG 1358, Fiction Workshop; ENG 1362, Publication Arts; ENG 1359, Nonfiction Workshop; ENG 1361, The Writing Process; ENG 1360, Topics in Writing: Reading and Writing Nonfiction.

Minor in Linguistics

See Interdisciplinary Minors.

Minor in Technical Communications

See Interdisciplinary Minors.

Geology

Bachelor of Arts

GEO 1212, Physical Geology; GEO 1213, Physical Geology Laboratory; GEO 1222, Historical Geology; GEO 1223, Historical Geology Laboratory; GEO 1310, Descriptive Mineralogy; GEO 1311, Optical Crystallography; GEO 1312, Petrography; GEO 1418, Structural Geology; six geology electives.

MTH 1106, MTH 1107, Fundamentals of Mathematics I and II; *or* MTH 1107, MTH 1108, Calculus I and II; PHY 1231, Physics for Science Majors; *or* PHY 1201, Physics for the Life Sciences I; CHM 1111, General Chemistry I; CHM 1122, General Chemistry II.

Bachelor of Science

GEO 1212, Physical Geology; GEO 1213, Physical Geology Laboratory; GEO 1222, Historical Geology; GEO 1223, Historical Geology Laboratory; GEO 1305, Rock Identification Laboratory; GEO 1310, Descriptive Mineralogy; GEO 1311, Optical Crystallography; GEO 1312, Petrography. GEO 1418, Structural Geology; eight geology electives.

MTH 1107, MTH 1108, Calculus I and II, *or* MTH 1123, MTH 1124, MTH 1125, Calculus I, II, and III; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III; CHM 1111, CHM 1122; *or* CHM 1151, CHM 1152, General Chemistry I and II; CHM 1231 *or* CHM 1221, Analytical Chemistry; *or* CHM 1391, Physical Chemistry; *or* GEO 1412, Geochemistry; two approved additional science electives.

Minor in Geology

GEO 1212, Physical Geology; GEO 1222, Historical Geology; GEO 1310, Descriptive Mineralogy; plus two of the following one-credit laboratories; GEO 1213, Physical Geology Laboratory; GEO 1223, Historical Geology Laboratory; GEO 1305, Rock Identification Laboratory; plus four geology electives (GEO 1412 or higher number) chosen with the approval of the Earth Science Department.

History

Bachelor of Arts

HST 1101 and HST 1102, Western Civilization I and II; HST 1201 and HST 1202, United States to 1877 and United States since 1877; HST 1241, The Historian's Craft; HST 1805, Approaches to History; nine history electives distributed as follows: two courses in Group A (ancient, medieval, early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); one course in any of the above groups.

Recommended: Courses in the related social sciences.

Bachelor of Science

HST 1101 and HST 1102, Western Civilization I and II; HST 1201 and HST 1202, United States to 1877 and United States since 1877; HST 1241, The Historian's Craft; HST 1251, Social Science Methodology; HST 1805, Approaches to History; eleven history electives distributed as follows: two courses in Group A (ancient, medieval, and early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); three courses in any of the above groups.

Either a social science minor that requires some theoretical or methodological courses; *or* a social science minor without theoretical or methodological courses (in which case students must take either PSY 1211, SOC 1320, *or* ECN 1250 or another acceptable statistics course); *or* a coherent program in science *and/or* social science composed of six courses (in which case students should consult with their departmental adviser and have the approval of the Undergraduate Committee in the Department of History); *or* a recognized minor in another college of the University (e.g. Business Administration).

A computer course approved by the departmental adviser.

Minor in History

Eight courses in history, two of which must be selected from the following: HST 1101, Western Civilization I; HST 1102, Western Civilization II; HST 1201, U.S. to 1877; HST 1202, U.S. since 1877.

Human Services

Bachelor of Arts

Prerequisite Courses: SOC 1100, Introduction to Sociology; or ED 1100, Education and Social Science; ED 1302, The Human Services Professions; PSY 1111 and PSY 1112, Foundations of Psychology I and II; or ED 1102 and ED 1103, Human Development and Learning I and II; POL 1111, Introduction to American Government; ECN 1115 or ECN 1116, Principles of Macroeconomics or Principles of Microeconomics; or equivalent.

Core Courses: PSY 1211, Statistics in Behavioral Science I; or SOC 1320, Introduction to Statistical Analysis or ED 1307, Introduction to Educational Statistics; PSY 1511, Experimental Design in Psychology; or SOC 1321, Research Methods I, or SOC 1324, Human Services Research and Evaluation; SOC 1240, Sociology of Human Services Organizations; PSY 1272, Personality I; PSY 1373, Abnormal Psychology I; ED 1300, Education and Psychosocial Development; SPC 1338, Group Discussion; or ED 1301, Educational Applications of Social Psychology or ED 1317, Seminar in Group Process; CRS 1310, Intervention Strategies; INT 1333, Senior Seminar.

Specified Electives(any three courses): SOC 1245, Sociology of Poverty; SOC 1250, The Sociology of Private and Public Assistance; POL 1308, The Politics of Poverty; ECN 1315, Income Inequalities and Discrimination; AFR 1240, Contemporary Issues in Black Society; AFR 1150, Black Cultural Development in the United States; AFR 1243, Minorities, Ethnicity, and Human Rights; ED 1310, Class and Ethnic Relations in Education; CRS 1200, Introduction to Special Education.

Specializations (five courses in any one specialization): Specializations are individually constructed by the student and his/her adviser. Alternatives are grouped in three broad clusters: Clinical, Community, and Administration.

Fieldwork: INT 1330, Human Services Fieldwork I; INT 1331, Human Services Fieldwork II.

Prerequisite Courses, Core Courses, and Fieldwork Courses follow the standard Human Services major.

Three Specified Electives selected from the list above, including the following alternatives: PSY 1271, or SOC 1135, Social Psychology; SOA 1135, Language and Culture; SOA 1101, Culture, Meaning, and Everyday Experience; ENG 1118, Introduction to Language; PSY 1263, Body Language; SOC 1140, Sociology of Prejudice; SPC 1232, Male and Female Communications; CRS 1313, Introduction to Counseling.

Deaf Studies Specialization: ASL 1101, American Sign Language I; ASL 1102, American Sign Language II; ASL 1201, Intermediate American Sign Language I; ASL 1202, Intermediate American Sign Language II; *and five courses selected from:* ASL 1211, Deaf Culture; ASL 1212, Deaf History; PSY 1363, American Sign Language Linguistics; PSY 1261, Bilingualism; SLA 1101, Introduction to Speech and Hearing; ASL 1401, American Sign Language Literature.

Specialization in Deaf Studies

Interdisciplinary Studies

Independent Major

An eligible student may petition the College Curriculum Committee to meet requirements for the B.A. degree in an Independent major. Eligibility, procedures, and requirements must be discussed in advance with an adviser in the Dean's Office. No student may be considered an Independent major until a curriculum proposal has been submitted to, and approved by, the Curriculum Committee.

Minor in Asian Studies

The minor program allows students the choice of concentration in Middle East Studies or East Asian Studies (China, Japan, Korea). In each concentration there are three core courses and four electives.

Middle Eastern Studies Concentration: Core courses: HST 1612, The Modern Middle East; POL 1345, Government and Politics in the Middle East; and PHL 1280,

Islam. Choose four of the following electives: SOC, Social Change; POL 1384, Arab-Israeli Conflict; HST 1652, Islam Resurgent; HST 1613, Contemporary Middle East; HST 1614, The Middle East Today in Fact, Fiction, Film; MUS 1182, Music of the Middle East; ECN 1332, Economic History of Less Developed Countries.

East Asian Studies Concentration: SOC 1432, People and Culture of China; POL 1332, Government and Politics of Japan; PHL 1215, Eastern Religions. Choose four electives: SOC 1104, Contemporary Japanese Culture and Society; POL 1371, Government and Politics of China; POL 1372, China's Foreign Relations; HST 1641, Recent Leaders of Asia; HST 1633, China Since 1850; HST 1637, Japan Since 1850; HST 1634, Communist China; PHL 1255, Indian Philosophy; PHL 1250, Chinese Philosophy; PHL 1130, Ethics: East and West; PHL 1293, Mysticism; East and West; HST 1670, Introduction to Third World History. For both concentrations, it is strongly recommended that students pursue language training to gain proficiency in an Asian language. Chinese courses are currently taught in the Basic College program.

Minor in Film Studies

The Film Studies minor permits students to acquire skills in the analysis of one of the major art forms and cultural influences of the twentieth century and to gain critical tools that can be used to study the relationships between film and society, history, aesthetics, philosophy, and psychoanalysis. Students take eight of the following courses, including two required courses, a filmmaking requirement, and five electives. Due to their interdisciplinary nature, many courses are listed with other departments.

Required courses: LNF 1550, Introductory Film Analysis; LNF 1551, Film Theory. Filmmaking requirement: One of the following: ART 1170, Filmmaking Workshop; ART 1171, Animation Workshop; or SPC 1450, Television I.

Electives: ART 1233, Contemporary Directions in Cinema; ART 1235, History of Film; ART 1236, The American Film; ART 1238, Documentary Film; ART 1800, Directed Study; ENG 1288, Film and Text; ENG 1289, Shakespeare on Film; ENG 1290, Topics in Film (may not be counted more than twice); ENG 1291, Popular Culture; ENG 1294, Modern Film; INT 1320, Exploring the Humanities through Film; HST 1494, History and Film; LNF 1321, French Film Masterpieces; LNF 1560, Film and Psychoanalysis; LNS 1550, Spanish Film Masterpieces.

For more information, contact the Film Studies Coordinator, Professor Inez Hedges, at 437-5163.

Minor in Linguistics

A total of six courses are required. ENG 1118, Introduction to Language and Linguistics. Choose one course from: ENG 1401, Introduction to Syntax; PSY 1262, Language and Cognition; PSY 1361, Introduction to Phonetics. Choose four courses from: ENG 1119, History of the English Language; *ENG 1401, Introduction to Syntax; ENG 1402, Grammars of English; ENG 1407, Introduction to Semantics; ENG 1408, Topics in Linguistics; ENG 1690, Junior-Senior Seminar (in Stylistics); LNL 1235 Applied Linguistics; LNL 1236, Applied Linguistics II; PHL 1215, Symbolic Logic; PHL 1440, Philosophy of Language; PSY 1261, Bilingualism; *PSY 1262, Language and Cognition; PSY 1263, Body Language; *PSY 1361, Introduction to Phonetics; PSY 1362, Child Language; PSY 1363, Linguistics of American Sign Language; PSY 1364 Cognition; PSY 1365, Language and the Brain; PSY 1562, Lab in Psycholinguistics; PSY 1661, Seminar in Psycholinguistics; PSY 1662, Seminar in Cognition; SOA 1135, Language and Culture.

*If not already taken.

Minor in Marine Studies

Revised requirements are available at the Marine Science and Maritime Studies Center.

Minor in Media Studies

To qualify for a minor in Media Studies, the student must complete a minimum of eight courses as follows: three required courses: SPC 1250, Introduction to Mass Communication; HST 1575, History of Media in America; and SPC 1300, Introduction to Communication Theory or SPC 1317, Theories of Audience Behavior; or INT 1320, Exploring Humanities through Film; and five elective courses from the two categories Media Production and Media Application (at least two electives in each category). Individual student programs will be developed in

consultation with faculty advisers. Interested students should contact Dr. Zaremba (Department of Speech Communication) for information on program development and elective choices.

Minor in Sport and Society

A minor in Sport and Society is being developed. Consult Alan Klein in the Sociology Department (437-2686) for more information.

Minor in Technical Communication

Technical communication combines written, oral, and graphics skills with a background in science or technology. The minor in Technical Communication gives students the opportunity to prepare themselves for careers as technical writers, or for careers in which technical communication is a significant part of their jobs. Students in English or other liberal arts studies may elect the minor, as may students from a variety of technological or scientific fields. A student does not have to be enrolled in the College of Arts and Sciences to declare the minor. Eight courses are required. Students must choose courses from the following areas:

Writing Courses

ENG 1125 Technical Communication I (Required)

Choose two of the following:

ENG 1370 Technical Writing II

ENG 1371 Writing for the Computer Industry

ENG 1380 Writing for the Professions: Health Services

ENG 1352 Advanced Writing

ENG 1381 Writing for the Professions: Business Administration

One of these courses must be ENG 1370 or 1371.

Speech Communication Courses

Choose one:

SPC 1116 Business and Professional Speaking

SPC 1331 Interpersonal Communication II

Graphic Arts Courses

JRN 1440 Design and Graphics

You may take an equivalent in another department or college.

Computer Programming

COM 1101 Introduction to Computers I (Required)

Computer Science and Science Courses *

Choose two courses. We strongly recommend a sequence of two in the same area.

IIS 1125 COBOL Programming I

GE 1106 FORTRAN Programming

BIO 1130 General Biology

BIO 1131 Animal Biology

CHM 1111 General Chemistry

CHM 1112 General Chemistry

GEO 1212 Physical Geology

GEO 1213 Historical Geology

PHY 1231 Physics for Science Majors I

PHY 1232 Physics for Science Majors II

PHY 1233 Physics for Science Majors III

Minor in Urban Studies

Students must take 28 quarter hours (seven courses) as follows: *Required Courses (three)*: SOC 1147, Urban Society; POL 1324, Urban Politics; ECN 1320, Urban Economics. One course from each of the following four areas: *Urban Problems and Policies* (SOC 1346, Suburb and Metropolis'; POL 1318, State and Local Government; ECN 1321, Urban Economic Problems and Policies), *Urban Humanities* (HST 1391, European Urban History to 1850; HST 1543, American Urban History; ENG 1608, The City in Literature), *Urban Form and Design* (ART 1113, Architecture and the City; ART 1225, Technology, Architecture, and the City; ART 1150, Introduction to Architectural Design), *African-American Studies* (AFR 1261, Economics of Urban Poverty; AFR 1275, Urban Political Issues; AFR 1475, Public Policy Analysis).

To obtain credit for the minor, students must file a petition form with the College of Arts and Sciences at the time of senior clearance. Petition forms may be obtained

at the College office or from advisers for the program. Interested students should confer with an adviser as soon as possible. Advisers are: Professor Robert Gilbert, Political Science (303 ME, ext. 2796); Professor Ronald McAllister, Sociology/Anthropology (500 HO, ext. 2868); Professor Clay McShane, History (203 ME, ext. 2660); Professor Peter Serenyl, Art (401 UO, ext. 2346); Professor Gregory Wassell, Economics (317 LA, ext. 2196).

Minor in Women's Studies

Students take nine of the following courses, including four required interdisciplinary courses, and five electives.

Required Interdisciplinary Courses: INT 1150, Introduction to Women's Studies; SOC 1302, Feminist Perspectives on Society; INT 1850, Seminar in Research I; INT 1851, Seminar in Research II.

Elective Courses: SOA 1160, Sex, Sex Roles, and the Family; SOC 1102, Evolution and Society; SOC 1155, Sociology of the Family; SOC 1160, Sex and Gender Roles; SOC 1177, Social Roles in Business; SOC 1178, Women Working; SOC 1217, Women, Health, and Social Change; SOC 3155, The Family; SOC 3160, Men, Women, and Social Change; HST 1472, Family in European History; HST 1392, Women in European History; HST 1473, Women in Modern Europe; HST 1554, The American Women; HST 1553, Family in American History; HST 3399, Approaches to Women's History; AFR 1241, The Black Family; AFR 1480, Black Women/Black Men; BIO 1187, Biology of Human Reproduction; PHL 1295, Medicine, Religion, and the Healer's Art; DRA 1128, Women in Western Drama; DRA 1129, Sexuality in Drama; ENG 1551, Sex Roles in Literature; MUS 1106, Women in Music; POL 1327, Sex Roles in American Politics; POL 1328, Women in Public Management; POL 1316, Contemporary Revolutionary Politics; POL 3665, Women in Public Management; POL 3667, Equal Opportunity in Public Administration; POL 3668, Legal Issues in Personnel Administration; PSY 1218, Psychology of Women; CJ 1616, Women and Criminal Justice, LNS 1510, Saints and Sinners. The Vision of Women in the Middle Ages and the Renaissance; NUR 1303, Life Crises: Analysis and Response.

These courses represent the most current listing. New courses are continually being developed and added to the program. For more information about courses and the Women's Studies Program contact Professor Debra Kaufman (ext. 2686).

Journalism

Bachelor of Arts Bachelor of Science

Each major will complete the journalism core and one of four concentrations—Newspaper/Print, Radio-Television News, Advertising, or Public Relations—to correspond with his/her career objective.

Journalism Core: JRN 1501, History of Journalism; JRN 1512, Journalism, Ethics and Issues; JRN 1103, Newswriting I; JRN 1104, Newswriting II; JRN 1206, Editing; JRN 1508, Law of the Press; JRN 1301, Photojournalism.

Newspaper/Print Concentration: JRN 1305, Techniques of Journalism; JRN 1432, Local Government Reporting; JRN 1440, Design and Graphics; JRN 1575, Publication Production and Management; one journalism elective.

Radio-Television News Concentration: JRN 1320, Radio News Gathering and Writing; JRN 1421, Television Newswriting; JRN 1422, Television News Production; JRN 1894, Directed Study; one journalism elective.

Public Relations Concentration: JRN 1336, Public Relations Principles; JRN 1440, Design and Graphics; JRN 1460, Public Relations Problems; JRN 1561, Public Relations Practice; one journalism elective.

Advertising Concentration: JRN 1440, Design and Graphics; JRN 1350, Advertising Principles; JRN 1451, Advertising Copy Writing; JRN 1552, Advertising Practice; one journalism elective.

Each major will complete the following related requirements:

ENG 1275, Grammar for Journalists; ENG 1110, Freshman English I; ENG 1111, English II. One course from this list: ENG 1120, Survey of English Literature I;

ENG 1121, Survey of English Literature II; ENG 1123, Survey of American Literature I; ENG 1124, Survey of American Literature II; and one additional English or American literature elective.

POL 1310, American Ideology; POL 1318, State and Local Government; HST 1201, United States to 1877; HST 1202, United States since 1877; ECN 1115, Principles of Macroeconomics; and one additional course in economics or business; MTH 1152 Statistical Thinking; PHL 1200, Introduction to Logic I; PHL 1140, Social and Political Philosophy; two history electives; COP 1135, Professional Development for Journalists.

Introduction to Art, Drama, and Music or one course from each of the following categories—(a): ART 1106, Introduction to Art; ART 1220, American Sculpture and Painting; (b): MUS 1100, Music I; MUS 1101, Music as a Listening Experience.

Bachelor of Arts

In addition to the journalism and related requirements above, candidates for the Bachelor of Arts degree will complete three courses in science and/or math.

Bachelor of Science

In addition to the journalism and related requirements above, candidates for the Bachelor of Science degree will complete six courses in sciences and/or math.

Linguistics

Bachelor of Arts

Freshman Requirements: ENG 1110, Freshman English I; ENG 1111, English II; mathematics course; two courses from the humanities; two from the sciences; and two from the social sciences.

General Requirements: ENG 1118, Introduction to Language and Linguistics; PSY 1262, Language and Cognition; PSY 1361, Introduction to Phonetics; SOA 1135, Language and Culture; ENG 1401, Introduction to Syntax; PHL 1215, Symbolic Logic.

Language Proficiency: Two advanced courses in a spoken second language (see Bachelor of Sciences for proficiency in American Sign Language).

Additional Courses: Five courses from the following: PSY 1261, Bilingualism; PSY 1362, Child Language; PSY 1363, Linguistics of American Sign Language; PSY 1364, Cognition; PSY 1365, Language and the Brain; PSY 1264, Animal Communication; PSY 1263, Body Language; PHL 1440, Philosophy of Language; ENG 1119, Foundations of the English Language; ENG 1402, Grammars of English; ENG 1407, Introduction to Semantics; ENG 1408, Topics in Linguistics; LNL 1235, Applied Linguistics; LNG 1236, Advanced Applied Linguistics.

Laboratory Course: PSY 1562, Laboratory in the Psychology of Language. Seminars: Two of the following: PSY 1661, Seminar in Psycholinguistics; ENG 1690, Seminar in Stylistics.

Practicum: One course: fieldwork, directed study, sign language teaching or interpreting.

Bachelor of Science

Same requirement as the Bachelor of Arts, except that American Sign Language can count toward the second-language proficiency requirement.

Mathematics

Bachelor of Arts

MTH 1143, MTH 1144, MTH 1145, Calculus I, II, and III; MTH 1243, MTH 1244, Calculus and Linear Methods I and II; MTH 1245, MTH 1246, Differential Equations and Linear Methods I and II; MTH 1301, Linear Algebra; MTH 1311, Analysis I; four approved mathematics electives selected in consultation with an adviser. PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III.

Bachelor of Science

MTH 1143, MTH 1144, MTH 1145, Calculus I, II, and III; MTH 1243, MTH 1244, Calculus and Linear Methods I and II; MTH 1245, MTH 1246, Differential Equations and Linear Methods I and II; MTH 1301, Linear Algebra; MTH 1311, Analysis I;

seven approved mathematics electives selected in consultation with an adviser.
PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III; two
nonscience courses.

Modern Languages

Bachelor of Arts

Eight advanced electives in the major language,* two advanced electives in the minor language.*

ENG 1120, ENG 1121, Survey of English Literature I and II; four history electives.

Bachelor of Science

Twelve advanced electives in the major language, including two conversation and composition courses; six advanced electives in the minor language,* including two conversation and composition courses; two history electives.

Minor in Modern Language

The Department of Modern Languages also offers a minor program for students whose major lies in other disciplines. The general requirement is *six* advanced courses (beyond the 1104 level) in the language. Interested students should consult with Professor Modee (ext. 2237) about specific course requirements.

*Courses beyond the intermediate level.

Music

Bachelor of Arts

MUS 1201, MUS 1202, MUS 1203, MUS 1204, Theory I, II, III, and IV; MUS 1301, 1302, Masterworks Analysis I and II; MUS 1241, Piano I; MUS 1120, Survey of Music History; MUS 1121, Medieval and Renaissance Music; MUS 1122, Music of the Baroque Era; MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; MUS 1125, Music of the Twentieth Century; three approved music electives; eight quarter hours of ensemble credits (MUS 1230, 1231, 1232, and/or 1233).

HST 1102, Western Civilization II; INT 1100, Introduction to Art, Music, and Drama; ART 1106, Introduction to Art; or DRA 1101, Theatre Appreciation; or DRA 1112, Drama Theory.

Minor in Music

MUS 1201, MUS 1202, MUS 1203, Theory I, II, and III; MUS 1241, Piano Class I; MUS 1120, Survey of Music History; one approved music elective; any *one* of the following courses: MUS 1121, Medieval and Renaissance Music; MUS 1122, Music of the Baroque Era; MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; MUS 1125, Music of the Twentieth Century.

Philosophy

Bachelor of Arts

PHL 1225, Ancient Philosophy; PHL 1230, Modern Philosophy; PHL 1200, Introduction to Logic I; or PHL 1215, Symbolic Logic; PHL 1400, Theory of Knowledge; or PHL 1405, Metaphysics; or PHL 1335, Moral Philosophy; one philosophy seminar; eight philosophy electives.

Bachelor of Science

PHL 1225, Ancient Philosophy; PHL 1230, Modern Philosophy; PHL 1200, Introduction to Logic I; or PHL 1215, Symbolic Logic; PHL 1400, Theory of Knowledge; or PHL 1405, Metaphysics; or PHL 1335, Moral Philosophy; one philosophy seminar; eight philosophy electives.

Minor in Philosophy

To qualify for a minor in Philosophy, a student must take twenty-eight quarter hours in philosophy to be distributed as follows:

Introductory courses: PHL 1100, Introduction to Philosophy I; or PHL 1105, Introduction to Scientific Method; *History of Philosophy:* PHL 1225, Ancient Philosophy; or PHL 1230, Modern Philosophy. *Logic Requirement:* PHL 1200, Introduction to Logic I; or PHL 1215, Symbolic Logic. At least one of the following courses: PHL 1142, Philosophy of Mind; PHL 1400, Theory of Knowledge; PHL 1405, Metaphysics; PHL 1335, Moral Philosophy.

Electives: Three electives; three electives in Philosophy.

Physics

Bachelor of Arts

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III, and their associated laboratories—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; three upper-level physics lecture courses, three upper-level laboratory courses.

MTH 1143, MTH 1144, MTH 1145, Calculus I, II, and III; MTH 1243, MTH 1244, Calculus and Linear Methods I and II; one advanced mathematics elective.

Bachelor of Science

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III, and their associated laboratories—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; PHY 1303, Modern Physics; PHY 1304, Mathematical Physics; PHY 1305, Thermodynamics and Kinetic Theory; PHY 1401, Classical Mechanics; PHY 1402, PHY 1403, Electricity and Magnetism I and II; PHY 1404, Wave Motion and Optics; three upper-level laboratory courses.

MTH 1143, MTH 1144, MTH 1145, Calculus I, II, and III; MTH 1243, MTH 1244, Calculus and Linear Methods I and II; MTH 1245, MTH 1246, Differential Equations and Linear Methods I and II; five additional electives from those approved for majors in the following fields: physics, mathematics, chemistry, engineering, biology, and geology.

Bachelor of Science in Applied Physics

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III, and their associated laboratories—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; PHY 1303, Modern Physics; PHY 1305, Thermodynamics and Kinetic Theory; PHY 1404, Wave Motion and Optics; PHY 1551 and PHY 1552, Electronics for Scientists I and II; PHY 1555, Wave Laboratory; PHY 1557, Advanced Laboratory; PHY 1561, Project Laboratory. MTH 1143, MTH 1144, MTH 1145, Calculus I, II, and III; MTH 1243, MTH 1244, Calculus and Linear Methods I and II; MTH 1245, MTH 1246, Differential Equations I and II.

COM 1100, COM 1101, Pascal I and II; COM 1201, Data Structures. Four additional electives from those approved for majors in the following fields: physics, mathematics, chemistry, computer science, engineering, biology, and geology.

Minor in Physics

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III or PHY 1221, PHY 1222, PHY 1223, PHY 1224, Physics for Engineering Students I, II, III, and IV; and three upper-level lecture or laboratory courses from the following list: PHY 1301, PHY 1302, PHY 1303, PHY 1304, PHY 1305, PHY 1401, PHY 1402, PHY 1403, PHY 1404, PHY 1411, PHY 1412, PHY 1413, PHY 1414, PHY 1415, PHY 1416, PHY 1551, PHY 1552, PHY 1555.

Instrumentation for Science Major

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors I, II, and III; or PHY 1221, PHY 1222, PHY 1223, Physics for Engineering Students I, II, and III.

PHY 1555, Wave Laboratory; PHY 1551, PHY 1552, Electronics for Scientists I and II; PHY 1557, Advanced Laboratory.

Political Science

Bachelor of Arts

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies (formerly Introduction to Comparative Politics); POL 1261, Public Administration; one political theory/thought course selected from the following: POL 1370, POL 1373, POL 1374; seven political science electives. Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, and sociology.

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies (formerly Introduction to Comparative Politics); POL 1301, Research Methods I; POL 1302, Research Methods II; POL 1261, Public Administration; and one political theory/thought course selected from the following: POL 1370, POL 1373, POL 1374; six political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, and sociology.

Minor in Political Science

Any two of the following courses: POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; POL 1261, Public Administration. Any five additional courses offered by the Department of Political Science for Political Science majors, including courses listed above that have not been selected to fulfill the above requirement.

Minor in International Politics

POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; any five additional courses in international politics and/or comparative politics offered by the Department of Political Science.

Concentration in Public Administration

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1301, Research Methods I; POL 1302, Research Methods II; POL 1260, Public Policy Analysis; POL 1261, Public Administration; POL 1266, Public Personnel Administration; POL 1267, Public Budgeting; POL 1262, Organization Theory; and one political theory/thought course selected from the following: POL 1370, POL 1373, POL 1374; four public administration electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, and sociology.

Psychology

Bachelor of Arts

Psychology Courses. Basic Courses: PSY 1110, Perspectives in Psychology; and PSY 1112, Foundations of Psychology II; PSY 1211 and PSY 1212, Statistics in Behavioral Sciences I and II. *Specialty Courses:* PSY 1271, Social Psychology, or PSY 1272, Personality I; PSY 1381, Sensation; or PSY 1382, Perception; PSY 1262, Language and Cognition; PSY 1231, Learning and Motivation I; and PSY 1351; Neuropsychology I.

Students choose either General Psychology or one of four areas of concentration: Language and Cognition; Learning, Motivation, and Behavior Analysis; Personality and Social Psychology; or Sensory and Neuropsychology. The additional courses required for each concentration follow:

General Program: Four psychology electives, excluding TIPS* courses; three psychology laboratories; and one psychology seminar.

Language and Cognition Electives: Two from the following courses: Bilingualism, PSY 1261; Intro. to Phonetics, PSY 1361; Child Language, PSY 1362; Linguistics of ASL, PSY 1363; Cognition, PSY 1364; Language and the Brain, 1365. Also any two additional psychology courses, excluding Topics in Psychology (TIPS) courses.

Laboratories: Psycholinguistics, PSY 1562; Cognition, PSY 1564; Directed Study in Language and Cognition, PSY 1890.

Seminar: Psycholinguistics, PSY 1661, or Cognition, PSY 1662.

Learning, Motivation, and Behavior Analysis Electives: Learning and Motivation II, PSY 1331; Programmed Learning, PSY 1332; Behavior Therapies, PSY 1431; and one of the following: Seminar in Behavior Theory, PSY 1631, or Seminar in Behavior Modification, PSY 1632.

Laboratories: Learning and Motivation, PSY 1531; Behavior Modification, PSY 1532; Directed Study in Learning and Motivation, PSY 1890.

Seminar: Behavior Theory, PSY 1631, or Behavior Modification, PSY 1632 (select whichever one was *not* used to fulfill the above psychology requirement).

Personality and Social Psychology Electives: Social Psychology, PSY 1271, or Personality I, PSY 1272 (select whichever course was not taken to fulfill basic psychology course requirements.); Personality II, PSY 1273. Also, Social Psychology, SOC 1135, and two courses from the following list: Aggression, SOA 1185; Sex, Sex Roles, and Family, SOA 1160; Sociology of Prejudice, SOC 1140; and Theories of Persuasion, SPC 1315. Credit for all courses taken outside of the Psychology Department will be counted toward the psychology major requirements only if the entire concentration is completed. If you change concentration or enroll in the general psychology track, such courses will be considered free electives.

Laboratories: Social Psychology, PSY 1571; or Personality, PSY 1572; and two additional psychology laboratory courses.

Seminar: One of the following: Social Psychology, PSY 1671; Clinical Psychology and Personality, PSY 1672; or Social Psychology, SOC 1337.

Sensory and Neuropsychology Electives: Sensation, PSY 1381, or Perception, PSY 1382 (select whichever course was not used to fulfill the specialty course requirements), and two courses from the following: Neuropsychology II, PSY 1352; Comparative Psychology and Ethology, PSY 1353; Functional Neuroanatomy, PSY 1354. Also, one course from the following: Seminar in Neuropsychology, PSY 1651; Seminar in Sensory Physiology, PSY 1652; Seminar in Sensation and Perception, PSY 1681.

Laboratories: Neuropsychology, PSY 1551; Sensation and Perception, PSY 1581; and one additional psychology laboratory course.

Seminar: One of the following: Neuropsychology, PSY 1651; Sensory Physiology, PSY 1652; Sensation and Perception, PSY 1681. (Select one of the two seminars that was not used to fulfill the psychology elective requirement described above.)

Bachelor of Science

General Requirements. Four mathematics, science, or computer science courses beyond the Core Curriculum requirements. Recommended courses include: BIO 1106, BIO 1107, PHY 1201-1531, PHY 1202-1532, CHM 1111, CHM 1151, MTH 1106, MTH 1107, MTH 1160. Also, one humanities course beyond the Core Curriculum requirements.

Psychology Courses. Basic Courses: PSY 1110, Perspectives in Psychology; and PSY 1112, Foundations of Psychology II; PSY 1211 and PSY 1212, Statistics in Behavioral Sciences I and II.

Specialty Courses: PSY 1271, Social Psychology, or PSY 1272, Personality I; PSY 1381, Sensation, or PSY 1382, Perception; PSY 1262, Language and Cognition; PSY 1231, Learning and Motivation I; and PSY 1351, Physiological Bases of Psychology.

Students choose either General Psychology or one of four areas of concentration: Language and Cognition; Learning, Motivation and Behavior Analysis; Personality

*TIPS means Topics in Psychology Courses.

and Social Psychology; or Sensory and Neuropsychology. The additional courses required for each concentration follow:

General Program: six psychology electives, excluding TIPS courses; four psychology laboratories; one psychology seminar; and one Directed Study of Honors Research, from PSY 1890 to PSY 1899. Directed Study and Honors research provide students with the opportunity to conduct research in a faculty member's laboratory. See your adviser early in the preceding quarter for assistance in selecting a potential sponsor for your research project. Make arrangements with your sponsor well in advance of registration.

Language and Cognition Electives: Two from the following courses: Bilingualism, PSY 1261; Intro. to Phonetics, PSY 1361; Child Language, PSY 1362; Linguistics of ASL, PSY 1363; Cognition, PSY 1364; Language and the Brain, PSY 1365. Also, Introduction to Language and Linguistics, ENG 1118, and two additional psychology courses, excluding TIPS courses.

Laboratories: Psycholinguistics, PSY 1562; Cognition, PSY 1564; Directed Study in Language and Cognition, PSY 1890; and one additional psychology laboratory course.

Seminar: Psycholinguistics, PSY 1661, or Cognition, PSY 1662.

Directed Study or Honors Research: One course from PSY 1890 to 1899. Directed Study and Honors research provide students with the opportunity to conduct research in a faculty member's laboratory. See your adviser early in the preceding quarter for assistance in selecting a potential sponsor for your research project. Make arrangements with your sponsor well in advance of registration.

Learning, Motivation, and Behavior Analysis Electives: Learning and Motivation II, PSY 1331; Programmed Learning, PSY 1332; Behavior Therapies, PSY 1431; and one of the following: Seminar in Behavior Theory, PSY 1631; Seminar in Behavior Modification, PSY 1632. Also, two additional psychology elective courses, excluding Topics in Psychology (TIPS) courses.

Laboratories: Learning and Motivation, PSY 1531; Behavior Modification, PSY 1532; Directed Study in Learning and Motivation, PSY 1890. Also, one additional psychology laboratory course.

Seminar: Behavior Theory, PSY 1631, or Behavior Modification, PSY 1632. (Select whichever one was not used to fulfill the psychology elective requirement described above.)

Directed Study or Honors Research: One course from PSY 1890 to PSY 1899. Directed Study and Honors research provide students with the opportunity to conduct research in a faculty member's laboratory. See your adviser early in the preceding quarter for assistance in selecting a potential sponsor for your research project. Make arrangements with your sponsor well in advance of registration.

Personality and Social Psychology Electives: Social Psychology, PSY 1271, or Personality I, PSY 1272 (select whichever course was not taken to fulfill basic psychology course requirements), Personality II, PSY 1273. Also, Social Psychology, SOC 1135, and two courses from the following list: Aggression, SOA 1185; Sex, Sex Roles, and Family, SOA 1160; Sociology of Prejudice, SOC 1140; and Theories of Persuasion, SPC 1315. Credit for all courses taken outside of the Psychology Department will be counted toward the psychology major requirements only if the entire concentration is completed. If you change concentration or enroll in the general psychology track, such courses will be considered free electives.

Laboratories: Social Psychology, PSY 1571, or Personality, PSY 1572; and three additional psychology laboratory courses.

Seminar: One of the following: Social Psychology, PSY 1671; Clinical Psychology and Personality, PSY 1672; or Social Psychology, SOC 1337.

Directed Study or Honors Research: One course from PSY 1890 to PSY 1899. Directed Study and Honors research provide students with the opportunity to conduct research in a faculty member's laboratory. See your adviser early in the preceding quarter for assistance in selecting a potential sponsor for your research project. Make arrangements with your sponsor well in advance of registration.

Sensory and Neuropsychology Electives: Sensation, PSY 1381; or Perception, PSY 1382 (whichever one was not used to fulfill the specialty course requirement); and two from the following: Neuropsychology II, PSY 1352; Comparative Psychology and Ethology, PSY 1353; Functional Neuroanatomy, PSY 1354. Also, two additional psychology courses, excluding the Topics in Psychology (TIPS) courses.

Laboratories: Neuropsychology, PSY 1551; Sensation and Perception, PSY 1581; and two additional psychology laboratory courses.

Seminar: One of the following: Neuropsychology, PSY 1651; Sensory Physiology, PSY 1652; Sensation and Perception, PSY 1681. (Select one of the two seminars that was not used to fulfill the psychology elective requirement described above.)

Directed Study and Honors Research: One course from PSY 1890 to PSY 1899. Directed Study and Honors research provide students with the opportunity to conduct research in a faculty member's laboratory. See your adviser early in the preceding quarter for assistance in selecting a potential sponsor for your research project. Make arrangements with your sponsor well in advance of registration.

Minor in Psychology

Psychology Courses: Basic Courses: PSY 1111, Foundations of Psychology I; PSY 1112, Foundations of Psychology II; PSY 1211, Statistics in Behavioral Science I; and PSY 1212, Statistics in Behavioral Science II.

Students choose either General Psychology or one of four areas of concentration: Language and Cognition; Learning, Motivation, and Behavior Analysis; Personality and Social Psychology; or Sensory and Neuropsychology.

The additional courses required for each concentration follow:

General Program: PSY 1271, Social Psychology I; or PSY 1272, Personality; PSY 1381, Sensation, or PSY 1382, Perception; PSY 1262, Language and Cognition; PSY 1231, Learning and Motivation I; PSY 1351, Neuropsychology; and one psychology laboratory.

Language and Cognition: PSY 1262, Language and Cognition. Select four of the following: PSY 1261, Bilingualism; PSY 1361, Introduction to Phonetics; PSY 1362, PSY 1363, Linguistics of ASL; Child Language; PSY 1364, Cognition; PSY 1365, Language and the Brain. Also, PSY 1562, Psycholinguistics; or PSY 1564, Cognition.

Learning, Motivation, and Behavior Analysis: PSY 1241, Human Behavioral Development I; PSY 1231, Learning and Motivation I; PSY 1331, Learning and Motivation II; PSY 1381, Sensation; PSY 1431, Behavior Change in Institutions; and PSY 1531, Learning and Motivation Laboratory.

Personality and Social Psychology: PSY 1271, Social Psychology; PSY 1272, Personality I; PSY 1273, Personality II; PSY 1373, Abnormal Psychology I; PSY 1373, Abnormal Psychology II; PSY 1374, Abnormal Psychology II; and PSY 1571, Laboratory in Social Psychology; or PSY 1572, Laboratory in Personality.

Sensory and Neuropsychology: PSY 1381, Sensation; PSY 1382, Perception; PSY 1351, Physiological Bases of Psychology I. Two of the following: PSY 1352, Physiological Bases of Psychology II; PSY 1353, Comparative Psychology and Ethology; or PSY 1354, Functional Neuroanatomy. Also, PSY 1581, Sensation and Perception; or PSY 1551, Neuropsychology.

Sociology-Anthropology

Concentration in Sociology

Bachelor of Arts

Preparatory Requirements: SOC 1100, Introduction to Sociology; and SOA 1100, Introduction to Anthropology. *Core Requirements:* SOC 1320, Introduction to Statistical Analysis; SOC 1321, SOC 1322, Research Methods I and II; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; SOC 1310, Class, Power, and Social Change (preferably in senior year). *Elective Requirements:* two intermediate courses (1100 or 1200 level); two advanced courses (1300 or above); one anthropology course beyond SOA 1100.

Six electives in the social sciences other than sociology-anthropology.

Bachelor of Science

Preparatory Requirements: SOC 1100, Introduction to Sociology and SOA 1100, Introduction to Anthropology. *Core Requirements:* SOC 1320, Introduction to Statistical Analysis; SOC 1321, SOC 1322, Research Methods I and II; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; SOC 1310, Class, Power, and Social Change (preferably in senior year). *Elective Requirements:* two intermediate courses (1100 or 1200 level); two advanced courses (1300 or above); one anthropology course beyond SOA 1100.

Six electives in the social sciences other than sociology-anthropology.

Approved six-course specialization.

Minor in Sociology

Requirements: SOC 1100, Introduction to Sociology; any two courses from among the following: SOC 1321, Research Methods I; SOC 1322, Research Methods II; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; and any three-course specialization in sociology arranged between the student and adviser.

Concentration in Anthropology

Bachelor of Arts

Preparatory Requirements: SOA 1100, Introduction to Anthropology; and SOC 1100, Introduction to Sociology. *Core Requirements:* at least three of the following: SOA 1135, Language and Culture; SOA 1155, Individual and Culture; SOA 1301, Human Origins; SOA 1160, Sex, Sex Roles, and Family; SOA 1103, Culture in Transition; SOA 1425, Tribal Society and Cultures; SOA 1146, Peasant Society and Culture; SOA 1470, Myth and Religion. *Elective Requirements:* at least six additional anthropology courses; one sociology elective beyond SOC 1100.

Six electives in the social sciences other than sociology-anthropology.

Bachelor of Science

Preparatory Requirements: SOA 1100, Introduction to Anthropology; and SOC 1100, Introduction to Sociology. *Core Requirements:* at least three of the following: SOA 1135, Language and Culture; SOA 1155, Individual and Culture; SOA 1301, Human Origins; SOA 1160, Sex, Sex Roles, and Family; SOA 1103, Culture in Transition; SOA 1425, Tribal Society and Cultures; SOA 1146, Peasant Society and Culture; SOA 1470, Myth and Religion. *Elective Requirements:* at least six additional anthropology courses; one sociology elective beyond SOC 1100.

Six electives in the social sciences other than sociology-anthropology.

Approved five-course specialization.

Minor in Anthropology

Requirements: SOA 1100, Introduction to Social Anthropology; SOA 1135, Language and Culture; SOA 1155, Individual and Culture; SOA 1160, Sex, Sex Roles, and Family; and any two-course specialization in anthropology arranged between the student and adviser.

Speech Communication

Concentration in Group and Public Communication

Bachelor of Arts

Required Courses: SPC 1115, Introduction to Communication Skills; SPC 1300, Introduction to Communication Theory; SPC 1239, Argumentation and Debate, or SPC 1338, Group Discussion; SPC 1330, Interpersonal Communication I; SPC 1315, Theories of Persuasion, or SPC 1410, Contemporary Public Address; eight speech communication electives; POL 1110, Introduction to Politics, or POL 1111, Introduction to American Government; PSY 1112, Foundations of Psychology II, or SOC 1100, Introduction to Sociology; PSY 1271, Social Psychology, or SOC 1135, Social Psychology.

Bachelor of Science

Required Courses: SPC 1115, Introduction to Communication Skills; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication I;

SPC 1338, Group Discussion; SPC 1315, Theories of Persuasion; SPC 1415, Persuasive Techniques; SPC 1600, Introduction to Communication Research; six speech communication electives to be chosen from the following: SPC 1239, Argumentation and Debate; SPC 1116, Business and Professional Speaking; SPC 1250, The Mass and the Media; SPC 1410, Contemporary Public Address; SPC 1317, Theories of Audience Behavior; SPC 1437, Consultation Skills; SPC 1331, Interpersonal Communication II; SPC 1232, Female/Male Communication; ENG 1118, Introduction to Linguistics; ENG 1407, Introduction to Semantics; PHL 1200, Introduction to Logic I. Also, eight social science credits beyond the introductory level, selected in consultation with the student's adviser and based upon their value to the student's post-graduate activities.

College of Arts and Sciences distribution requirements; no language requirement.

Concentration in Personal Performance

Bachelor of Arts

Required Courses: SPC 1115, Introduction to Communication Skills; SPC 1110, Voice and Articulation; SPC 1111, Oral Interpretation; SPC 1116, Business and Professional Speaking; SPC 1239, Argumentation and Debate; SPC 1210, Advanced Vocal Techniques, or SPC 1211, Advanced Oral Interpretation; SPC 1890, Directed Study; six speech communication electives.

Bachelor of Science

Required Courses: SPC 1115, Introduction to Communication Skills; SPC 1300, Introduction to Communication Theory; SPC 1110, Voice and Articulation; SPC 1111, Oral Interpretation; SPC 1890, Directed Study; eight speech communication electives selected from the following: SPC 1239, Argumentation and Debate; SPC 1116, Business and Professional Speaking; SPC 1210, Advanced Vocal Techniques; SPC 1211, Advanced Oral Interpretation; SPC 1315, Theories of Persuasion; SPC 1415, Persuasive Techniques; SPC 1338, Group Discussion; SPC 1318, Communication in Education; SPC 1250, The Mass and the Media; SPC 1410, Contemporary Public Address; SPC 1317, Theories of Audience Behavior; SPC 1437, Consultation Skills; SPC 1330, Interpersonal Communication I; SPC 1331, Interpersonal Communication II; SPC 1232, Female/Male Communication; SPC 1600, Introduction to Communication Research; ENG 1118, Introduction to Linguistics; ENG 1407, Introduction to Semantics; PHL 1200, Introduction to Logic I. In addition, the student must complete not less than four courses taught outside the Department, selected in consultation with his/her adviser on the basis of their value to the student's proposed post-graduate activities and approved by Speech Communication Curriculum Committee.

Theatre and Dance

Bachelor of Arts

Theatre majors have the opportunity of selecting one of seven concentrations: acting, scenic design, lighting design; costume design; literature/criticism; dance performance; and a generalist specialization. It is recommended that all theatre majors *except* those in the dance performance concentration select the following courses in their *Freshman* year: DRA 1100, Introduction to Theatre Arts; DRA 1150, Introduction to Acting; DRA 1200, Stagecraft; DRA 1212, Introduction to Theatre Design. It is recommended that those selecting the dance performance concentration select the following courses in their *Freshman* year: HSL 1153, Modern Dance I; HSL 1154, Modern Dance II; HSL 1156, Ballet I; HSL 1159, Jazz Dance; HSL 1165, Improvisation; HSL 1314, Movement Fundamentals; HSL 1630, Aspects of Dance; DRA 1100, Introduction to Theatre Arts.

The following department core courses are required of all theatre majors in all concentrations *except* dance performance. DRA 1100, Introduction to Theatre Arts; DRA 1106, DRA 1107, DRA 1108, Theatre History I, II, and III; DRA 1112, Drama Theory/Criticism; DRA 1150, Introduction to Acting; DRA 1180, Concepts

of Direction; DRA 1200, Stagecraft; DRA 1212, Introduction to Theatre Design; DRA 1800, DRA 1801, DRA 1802, DRA 1803, Practicum in Production; ENG 1279, The Modern Novel; ENG 1658, Introduction to Shakespeare.

Theatre majors with a dance performance concentration are required to complete these department core courses. DRA 1100, Introduction to Theatre Arts; DRA 1112, Drama Theory/Criticism; DRA 1150, Introduction to Acting; DRA 1180, Concepts of Direction; DRA 1200, Stagecraft; DRA 1212, Introduction to Theatre Design; DRA 1800, DRA 1801, DRA 1802, DRA 1803, Practicum in Production; HSL 1261, Anatomy/Physiology I; HSL 1262, Kinesiology I; HSL 1621, Dance in Cultural Perspectives; HSL 1630, Aspects of Dance; HSL 1632, Dance in the Twentieth Century; HSL courses are offered in the Boston-Bouvé College of Human Development Professions.

The following lists the specific requirements for each concentration:

Acting: DRA 1280, Stage Makeup; DRA 1300, Acting II, DRA 1301, Acting III; DRA 1370, Rehearsal and Performance; DRA 1155, Speech for the Theatre. Eight quarter hours in Physical Education from the following: Modern Dance, Ballet, Jazz Dance, Gymnastics, Fencing and Physical Conditioning. Also, eight quarter hours of dramatic literature elective courses offered by the department and two workshops in voice and movement training.

Costume Design: ART 1101, Art History Since 1400; ART 1124, Creative Drawing; ART 1254, Intermediate Drawing; DRA 1209, Theatrical Drafting; DRA 1210, Scene Design I; DRA 1226, Lighting Design I; DRA 1261, Costuming I; DRA 1265, Pattern Drafting and Costume Construction; DRA 1280, Stage Makeup; DRA 1400, Costuming II; and DRA 1410, Technical Production.

Dance Performance: HSL 1153, Modern Dance I; HSL 1154, Modern Dance II; HSL 1155, Modern Dance III; HSL 1156, Ballet I; HSL 1157, Ballet II, HSL 1158, Ballet III; HSL 1159, Jazz Dance I; HSL 1160, Jazz Dance II; HSL 1161, Jazz Dance III; HSL 1162, Rhythmic Analysis; HSL 1165, Dance Improvisation/Composition; HSL 1252, Dance Composition I; HSL 1272, Dance Composition II; HSL 1314, Movement Fundamentals; HSL 1321, Modern Dance IV; HSL 1322, Ballet IV; HSL 1324, Jazz Dance IV; HSL 1325, HSL 1326, HSL 1327, Dance Rehearsal and Performance I, II, and III; HSL 1634, Laban Movement and Analysis; HSL 1513, Independent Study III.

Lighting Design: ART 1101, Art History Since 1400; DRA 1209, Theatrical Drafting; DRA 1210, Scene Design I; DRA 1225, Scene Painting; DRA 1226, Lighting Design I; DRA 1246, Sound for the Theatre; DRA 1261, Costuming I; DRA 1280, Stage Makeup; DRA 1410, Technical Production; DRA 1420, Advanced Drafting and Construction; and DRA 1430, Lighting Design II.

Literature/Criticism: ART 1100, Art History to 1400; ART 1101, Art History Since 1400; DRA 1122, Twentieth Century European Theatre; DRA 1140, Playwriting I; MUS 1120, Survey of Music History; PHL 1340, Aesthetics; plus eight quarter hours in Special Topics in drama criticism offered by the department and eight quarter hours of dramatic literature elective courses offered by the department.

Scenic Design: ART 1101, Art History Since 1400; DRA 1209, Theatrical Drafting; DRA 1210, Scene Design I; DRA 1213, Scene Design II; DRA 1214, Scene Design III; DRA 1225, Scene Painting; DRA 1226, Lighting Design I; DRA 1261, Costuming I; DRA 1410, Technical Production; and DRA 1420, Advance Drafting and Construction.

Generalist: Completion of departmental core courses plus the completion of forty quarter hours of departmental electives.

Minor in Theatre

All students minoring in Theatre are required to complete the following courses (for thirty-two quarter hours): DRA 1106, Theatre History I; DRA 1107, Theatre History II; DRA 1108, Theatre History III; DRA 1150, Introduction to Acting; DRA 1180, Concepts of Direction; DRA 1200, Stagecraft; DRA 1212, Introduction to Theatrical Design; DRA 1100, Introduction to Theatre Arts. Laboratory practice in technical theatre and performance, in conjunction with the course requirements, is a required part of the minor.

Boston-Bouvé College of Human Development Professions

Specimen Program in Athletic Training/Teacher Preparation

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
BIO 1140	Bio. I	4	HSL 1256	L/C Plan	3	MTH 1106	Math	4
ENG 1110	Fresh. Eng. I	4	CHM 1111	CHEMISTRY I	5	HSL 1281	Curr. Hlth. Issues	4
ED 1100	Social Sci.	4	ENG 1111	Fresh. Eng. II	4	HSL 1253	Grp. D.	3
HSL 1255	Human Move.	3	ED 1102	Hum. Dev. I	4	HSL 1254	F. Aid	2
HSL 1101	Swimming	1	HSL 1109	Gymnastics I	1	HSL 1173	T & F	1
HSL 1133	Phy. Cond.	1	HSL 1140	Basketball	1	HSL 1110/12	Gym	1
						HSL 1257	H/P PE	3

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1261	Anat./Phys. I	4	INT 1100	Computer	4
HSL 1260	Motor Dev.	4	HSL 1627	THER. MOD.	4
PHY 1201	PHYSICS	4	ED 1103	Human Dev. II	4
HSL 1605	BASIC ATHL. TRNG.	3	HSL 1116	Tennis	1
HSL 1268	BASIC A.T. LAB	1	HSL 1132	Wt. Trng.	1
HSL 1259	Sec. School Act.	3		Elective (if needed)	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1611	Kinesiology	4	HSL 1610	Anat./Phys. II	4
ED 1307	Ed. Stat.	4	HSL 1626	Meas. & Ev.	4
HSL 1615	Critical Teaching	4	HSL 1626	THER. RECOND.	4
HSL 1608	CLINICAL A.T.	2	HSL	Tac	2
HSL 1114	Badminton	1	HSL 1606	Motor Learning	4
PSY 1111	Found. of Psych.	4			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1612	Exercise Physiol.	4	HSL 1616	Curriculum Dev.	3
HSL 1463	Overview of Dis.	4	HSL 1602	Theory of Coach.	2
HSL 1609	ADVANCED A.T.	4	HSL 1286	NUTRITION	4
	Elective	4		Elective	4
HSL 1423	COMM. REC. MGMT.		HSL 1266	PHY. COND. PROG.	2
HSL	Tac	2	HSL 1142	Volleyball	1
			HSL	Skill Elec.	1

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1623	Sup. St. Teach.		HSL 1617	Adm. of PE. or EI.	4
HSL 1624	A.T. INTERNSHIP		HSL 1600	PSYCH. OF SPORT	2
			HSL 1625	SENIOR SEMINAR	4
				Elective	4

Note: Courses spelled in capital letters are specific to concentration.

184 Q.H. = Minimum graduation requirement

Specimen Program in Cardiovascular Health and Exercise

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
BIO 1140	Bio. I	4	HSL 1256	L/C Plan	3	MTH 1106	Math	4
ENG 1110	Fresh. Eng. I	4	BIO 1141	BIOLOGY II	4	HSL 1281	Curr. Hlth. Issues	4
ED 1100	Social Sci.	4	ENG 1111	Fresh. Eng. II	4	ED 1103	Hum. D.	4
HSL 1255	Human Move.	3	ED 1102	Hum. Dev. I	4	HSL 1254	F. Aid	2
HSL 1101	Swimming	1	HSL _____	Guided Skill Elec.	1	HSL _____	Guided Skill Elec.	2
HSL 1133	Phy. Cond.	1						

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1261	Anat./Phys. I	4	INT 1100	Computer	4
HSL 1260	Motor Dev.	4	CHM 1112	CHEMISTRY II	5
CHM 1111	CHEMISTRY I	5	PSY 1111	Psychology I	4
HSL 1605	BASIC ATHL. TRNG.	3	_____	Elective	4
HSL 1268	BASIC A.T. LAB	1	HSL 1132	Wt. Trng.	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1611	Kinesiology	4	HSL 1610	Anat./Phys. II	4
ED 1307	Ed. Stat.	4	HSL 1626	Meas. & Ev.	4
CRS 1313	Intro. Counseling	4	_____	Elective	4
_____	Elective	4	_____	Elective	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1612	Exercise Physiol.	4	HSL 1613	Ex. TEST/PREC.	3
HSL 1423	COMM. REC. MKTG.	4	HSL 1614	ELECTROCARD.	4
HSL 1426	BUDGET ANALYSIS	4	HSL 1286	NUTRITION	4
_____	Elective	4	HSL 1506	COMM. HLTH.	4
			HSL 1266	Phy. Cond. Prog.	2

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1622	Sup. Field Exp.	12	HSL 1502	COMM. & DEG. DIS.	4
			HSL 1510	HLTH. COUNS.	4
			HSL 1866	SP. PROBLEMS	4
			_____	Elective	4

Note: Courses spelled in capital letters are specific to concentration.

177 Q.H. = Minimum graduation requirements

Specimen Program in Athletic Training/Cardiovascular Health and Exercise

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
BIO 1140	Bio. I	4	HSL 1256	L/C Plan	3	MTH 1106	Math	4
ENG 1110	Fresh. Eng. I	4	BIO 1141	BIOLOGY II	4	HSL 1281	Curr. Hlth. Issues	4
ED 1100	Social Sci.	4	ENG 1111	Fresh. Eng. II	4	ED 1103	Human Dev. II	4
HSL 1255	Human Move.	3	ED 1102	Hum. Dev. I	4	CHM 1111	CHEM. I	5
HSL 1101	Swimming	1	PSY 1111	Fnd. Psych.	4	HSL 1254	F. Aid	2
HSL 1133	Phy. Cond.	1						

Second Year

Quarter 4				Quarter 5		
No.	Course	Q.H.		No.	Course	Q.H.
HSL 1261	Anat./Phys. I	4		INT 1100	Computer	4
HSL 1260	Motor Dev.	4		HSL 1627	THER. MOD.	4
PHY 1201	PHYSICS	4		CHM 1112	CHEMISTRY II	5
HSL 1605	BASIC ATHL. TRNG	3		HSL 1132	Weight Training	1
HSL 1268	BASIC A.T. LAB	1		HSL 1600	PSYCH. OF SPORT	2

Third Year

Quarter 6				Quarter 7		
No.	Course	Q.H.		No.	Course	Q.H.
HSL 1611	Kinesiology	4		HSL 1610	Anat./Phys. II	4
ED 1307	Ed. Stat.	4		HSL 1626	Meas. & Ev.	4
CRS 1313	INTRO. COUNSEL.	4		HSL 1626	THER. RECOND.	4
HSL 1608	CLINICAL A.T.	2			Elective	4
	Elective	4				

Fourth Year

Quarter 8				Quarter 9		
No.	Course	Q.H.		No.	Course	Q.H.
HSL 1612	Exercise Phys.	4		HSL 1613	EX TEST/PRESC.	3
HSL 1463	Overview of Dis.	4		HSL 1614	ELECTROCARD.	4
HSL 1609	ADVANCED A.T.	4		HSL 1286	NUTRITION	4
HSL 1423	COMM. REC. MKTG.	4		HSL 1506	COMM. HEALTH	4
HSL _____	Skill Elective	1		HSL 1266	PHY. COND. PROG.	2

Fifth Year

Quarter 10				Quarter 11		
No.	Course	Q.H.		No.	Course	Q.H.
HSL 1622	Sup. Field Exp.			HSL 1502	COMM. & DEG. DIS.	4
HSL 1624	A.T. INTERNSHIP			HSL 1510	HEALTH COUNS.	4
				HSL 1625	SENIOR SEMINAR	4
				HSL 1866	SPECIAL PROB.	4

Note: Courses spelled in capital letters are specific to concentration.

186 Q.H. = Minimum graduation requirement

Specimen Program in Physical Education Teacher Preparation**First Year**

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
BIO 1140	Bio. I	4	HSL 1256	L/C Plan	3	MTH 1106	Math	4
ENG 1110	Fresh. Eng. I	4	CHM 1111	Chem. I or	5	HSL 1281	Curr. Hlth. Issues	4
ED 1100	Social Sci.	4	BIO 1141	BIO. II or	4	HSL 1253	Grp. D.	3
HSL 1255	Human Move.	3	PHY 1201	Physics	4	HSL 1254	F. Aid	2
HSL 1101	Swimming	1	HSL 1109	Gymnastics I	1	HSL 1173	T & F	1
HSL 1133	Phy. Cond.	1	HSL 1140	Basketball	1	HSL 1110/12	Gym	1
			ENG 1111	Fresh. Eng. II	4	HSL 1257	H/P PE	3
			ED 1102	Hum. Dev. I	4			

Second Year

Quarter 4				Quarter 5		
No.	Course	Q.H.		No.	Course	Q.H.
HSL 1261	Anat./Phys. I	4		INT 1100	Computer	4
HSL 1260	Motor Dev.	4			Elective	4
HSL 1258	Elem. Sch. Act. or	4		ED 1103	Human Dev. II	4
HSL 1259	Sec. Sch. Act.	3		HSL 1116	Tennis	1
HSL _____	Skill Elec. (Sec.)	1		HSL _____	Skill Elec.	1
	Elective	4			Elective	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1611	Kinesiology	4	HSL 1610	Anat./Phys. II	4
ED 1307	Ed. Stat.	4	HSL 1626	Meas. & Ev.	4
HSL 1615	Crit. Teaching	4	HSL 1606	Motor Learning	4
HSL _____	Tac	2	HSL _____	Tac	2
HSL 1114	Badminton	1	_____	Elective	2
PSY 1111	Found. of Psych.	4	HSL _____	Skill Elec.	1

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1612	Exer. Physiology	4	HSL 1616	Curriculum Dev.	3
HSL 1463	Overview of Dis.	4	HSL 1602	Thry. Coach. or	
_____	Elective	4	HSL 1603	Thry. Play	2
HSL _____	Skill Elective	1	_____	Elective	4
HSL _____	Tac (2)	4	HSL 1605	Basic A.T.	3
			HSL 1142	Volleyball	1
			_____	Elective	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1623	Sup. Stu. Teach.	12	HSL 1617	Adm. of PE.	4
			_____	Elective	4
			_____	Elective	4
			_____	Elec. (if need)	4

180 Q.H. = Minimum graduation requirement

Specimen Program in Recreation Management

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
SPS 1115	Speech Fund.	3	ENG 1111	Fresh. Eng. II	4	HSL 1281	Curr. Hlth. Issues	4
Eng 1110	Fresh. Eng. I	4	BIO 1140	Bio. I	4	BIO 1141	Bio. II	4
ED 1100	Soc. Sci.	4	HSL 1223	Life Career Planning	4	ED _____	Fdn. EI.	4
HSL 1220	Fdn. Ldship./ Leisure Serv.	4	INT 1100	Computer	4	HSL _____	Prof. Skills	4
						HSL 1222	Leisure Aw.	2

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
ED 1102	Human Dev. I	4	ED 1103	Human Dev. II	4
HSL 1261	Anat./Phy. I	4	HSL 1610	Anat./Phy. II	4
HSL 1221	Int. Rec. & Les. Serv.	3	_____	Guided Elective	4
_____	Science Elective	4	_____	Science Elective	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1408	Research Methods	4	HSL 1409	Research App.	4
HSL 1426	Budget Analysis	4	HSL 1401	Program Planning	4
HSL 1423	Comm. Rec. Mgmt.	3	HSL _____	Dept. Elective	3
_____	Guided Elective	4	_____	Guided Elective	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1400	Group Dynamics	3	HSL 1470	Int. Rec. & Les. Serv.	12
HSL 1406	Internship Sem.	1			
HSL 1446	El. Out. Rec. Pl.	4			
HSL _____	Dept. Elective	3			
_____	Guided Elective	4			

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1422	Prog. Eval. in Rec.	4	HSL 1410	Senior Seminar	4
HSL _____	Dept. Elective	3	HSL 1421	Admin. Rec/Parks	4
_____	Guided Elective	4	HSL _____	Dept. Elective	4
_____	Guided Elective	4	_____	Guided Elective	4

172 Q.H. = Minimum graduation requirement

Specimen Program in Therapeutic Recreation

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
SPC 1115	Speech Fund.	3	ENG 1111	Fresh. Eng. II	4	HSL 1281	Curr. Hlth. Issues	4
ENG 1110	Fresh. Eng. I	4	BIO 1140	Bio. I	4	BIO 1141	Bio. II	4
ED 1100	Soc. Sci.	4	HSL 1223	Life Career Planning	4	ED _____	Fdn. El.	4
HSL 1220	Fn. Ldsp. Ls. Sv.	4	INT 1100	Computer	4	HSL _____	Prof. Skills	4
						HSL 1222	Leisure Aw.	2

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
ED 1102	Human Dev. I	4	ED 1103	Human Dev. II	4
HSL 1261	Anat./Phys. I	4	HSL 1610	Anat./Phys. II	4
HSL 1221	Int. Rc. & Les. Serv.	3	_____	Guided Elective	4
_____	Science Elective	4	_____	Science Elective	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1408	Research Methods	4	HSL 1409	Research App.	4
HSL 1464	Prog. Plan. T/R	4	HSL 1401	Program Planning	4
HSL 1463	Overview of Dis.	4	HSL _____	Dept. Elective	3
_____	Guided Elective	4	_____	Guided Elective	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1400	Group Dynamics	3	HSL 1470	Intnshp. in Rec. & Les. Serv.	12
HSL 1406	Intnshp. Sem.	1			
HSL 1466	Fdn. Psych. Serv.	4			
HSL _____	Dept. Elective	3			
_____	Guided Elective	4			

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1467	Soc. & Psy. Imp.	4	HSL 1410	Senior Seminar	4
HSL _____	Dept. Elective	3	HSL 1462	Leisure Couns.	4
_____	Guided Elective	4	HSL _____	Dept. Elective	4
_____	Guided Elective	4	_____	Guided Elective	4

172 Q.H. = Minimum graduation requirement

Specimen Program in School and Community Health Education/ Athletic Training

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
CHM 1101	Chem. I	4	CHM 1102	Chem. II	4	MTH 1106	Math	4
ENG 1110	Fresh. Eng. I	4	BIO 1140	Bio. I	4	BIO 1141	Bio. II	4
ED 1100	Social Sci.	4	PSY 1111	PSYCH. I	4	ENG 1111	Fresh. Eng. II	4
HSL 1281	Curr. Hlth.	4	HSL 1280	Fnd. Hlth.	2	PSY 1112	PSYCH. II	4
HSL 1101	INT. SWIM.	1	HSL 1283	Intr. Saf.	2	HSL 1254	Fst. Aid	2
HSL 1133	PHY. COND.	1	HSL 1284	Inst. Res.	2			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1605	BASIC ATH. TR.	3	CRS 1313	INTRO. COUNS.	4
ED 1102	Human Dev.	4	ED 1103	Human Dev. II	4
HSL 1261	Anat./Phys. I	4	ED 1306	Meas. & Eval.	4
HSL 1286	Nutrition.	4	HSL 1285	Hlth. Care/Yth.	4
HSL 1268	BASIC A.T. LAB	1	HSL 1132	WT. TRNG.	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
BIO 1190	Microbiology	4	HSL 1610	Anat./Phys. II	4
HSL 1260	MOTOR DEV.	4	HSL 1516	Drug Use/Abuse	4
HSL 1500	Mental Health	4	HSL 1502	Comm./Deg. Dis.	4
HSL 1611	KINESIOLOGY	4	ED 1307	ED. STAT.	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1612	EXER. PHYS.	4	HSL 1613	EX. TEST/PRES.	3
HSL 1585	Teaching Proc.	4	HSL 1506	Comm. Health	4
HSL 1503	Human Sexuality	4	HSL 1507	Seminar I	2
HSL 1423	COMM. REC. MKTG.	4	HSL 1614	ELECTROCARD.	4
			HSL 1266	PHY. COND. PRG.	2
				Elective	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1521	Practicum	12	HSL 1509	Org./Ad. Hlth. Ed.	4
			HSL 1510	Health Couns.	4
			HSL 1508	Seminar II	2
			HSL 1504	Longevity/Aging	4
				Elec. (if need)	4

178 Q.H. = Minimum graduation requirement

Note: Courses in capital letters indicate courses specific to concentration.

Specimen Program in Community Health Education/Cardiovascular Health and Exercise

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
CHM 1101	Chem. I	4	CHM 1102	Chem. II	4	MTH 1106	Math	4
ENG 1110	Fresh. Eng. I	4	BIO 1140	Bio. I	4	BIO 1141	Bio. II	4
ED 1100	Social Sci.	4	PSY 1111	PSYCH. I	4	ENG 1111	Fresh. Eng. II	4
HSL 1281	Curr. Hlth.	4	HSL 1280	Fnd. Hlth.	2	PSY 1112	PSYCH. II	4
HSL 1101	INT. SWIM.	1	HSL 1283	Intr. Saf.	2	HSL 1254	Fst. Aid	2
HSL 1133	PHY. COND.	1	HSL 1284	Inst. Res.	2			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1605	BASIC ATH. TR.	3	CRS 1313	INTRO. COUNS.	4
ED 1102	Human Dev.	4	ED 1103	Human Dev. II	4
HSL 1261	Anat./Phys. I	4	ED 1306	Meas. & Eval.	4
HSL 1286	Nutrition	4	HSL 1285	Hlth. Care/Yth.	4
HSL 1268	BASIC A.T. LAB	1	HSL 1132	WT. TRNG.	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
BIO 1190	Microbiology	4	HSL 1610	Anat./Phys. II	4
HSL 1260	MOTOR DEV.	4	HSL 1516	Drug Use/Abuse	4
HSL 1500	Mental Health	4	HSL 1502	Comm./Deg. Dis.	4
HSL 1611	KINESIOLOGY	4	ED 1307	ED. STAT.	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1612	EXER. PHYS.	4	HSL 1613	EX. TEST/PRES.	4
HSL 1585	Teaching Proc.	4	HSL 1506	Comm. Health	4
HSL 1503	Human Sexuality	4	HSL 1507	Seminar I	2
HSL 1423	COMM. REC. MKTG.	4	HSL 1614	ELECTROCARD.	4
			HSL 1266	PHY. COND. PRG.	2
				Elective	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1521	Practicum	12	HSL 1509	Org./Ad. Hlth. Ed.	4
			HSL 1510	Health Couns.	4
			HSL 1508	Seminar II	2
			HSL 1504	Longevity/Aging	4
				Elec. (if need)	4

183 Q.H. = Minimum graduation requirement

Note: Courses in capital letters indicate courses specific to concentration.

Specimen Program in School and Community Health Education

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
CHM 1101	Chem. I	4	CHM 1102	Chem. II	4	MTH 1106	Math	4
ENG 1110	Fresh. Eng. I	4	BIO 1140	Bio. I	4	BIO 1141	Bio. II	4
ED 1100	Social Sci.	4	ED 1300	Ed. Soc.	4	ENG 1111	Fresh. Eng. II	4
HSL 1281	Curr. Hlth.	4	HSL 1280	Fnd. Hlth.	2	HSL 1254	Skill El.	1
HSL 1254	First Aid	2	HSL 1283	Intr. Saf.	2	PSY 1111	Psych. I	4
			HSL 1284	Inst. Res.	2			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
INT 1100	Computer	4	HSL 1285	Hlth. Conc./Yth.	4
ED 1102	Human Dev.	4	ED 1103	Human Dev. II	4
HSL 1261	Anat./Phys. I	4	ED 1306	Meas. and Ev.	4
PSY 1112	Psychology II	4	HSL 1286	Nutrition	4
HSL ———	Skill Elective	1			

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
BIO 1190	Microbiology	4	HSL 1610	Anat./Phys. II	4
ED 1104	Anal. Inst. Proc.	4	HSL 1516	Drug Use/Abuse	4
HSL 1500	Mental Health	4	HSL 1502	Comm./Deg. Dis.	4
	Elective	4		Elective	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
CRS 1200	Intro. Spec. Ed.	4	HSL 1504	Longevity/Aging	4
HSL 1585	Teaching Proc.	4	HSL 1506	Comm. Health	4
HSL 1503	Human Sexuality	4	HSL 1507	Seminar I	2
	Elective	4		Electives (2)	8

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1520	Student Teaching	12	HSL 1509	Org./Ad. Hlth. Ed.	4
	or		HSL 1510	Health Couns.	4
HSL 1521	Practicum	12	HSL 1508	Seminar II	2
			ED 13	(12,13,14) El.	4

178 Q.H. = Minimum graduation requirement

Specimen Program in Physical Education/Dance Teacher Certification**First Year**

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
INT 1100	Int. Th.	4	ENG 1111	Fresh. Eng. II	4	MTH 1106	Math.	4
ENG 1110	Fresh. Eng. I	4	HSL 1256	L/C Plan	3	HSL 1253	Group D.	3
ED 1100	Soc. Sci.	4	ED 1102	Hum. Dev. I	4	HSL 1254	First Aid	2
HSL 1630	Asp. Dnce.	3		Elective	4		Elective	4
HSL 1314	Mv. Fund	1	HSL 1159	Jazz Dance I	1	HSL 1154	Mod. II	1
HSL 1156	Ballet I	1	HSL 1153	Modern I	1	HSL 1165	Dance Improvisation	1

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1260	Motor Dev.	4	HSL 1100	Computer	4
HSL 1261	Anat./Phys. I	4	HSL 1103	Human Dev. II	4
HSL 1252	Dance Comp. I	3	HSL 1621	Dance/Culture	4
HSL 1250	Creat. Dnc. El. or	2	HSL 1272	Dance Comp. II	3
HSL 1251	Creat. Dnc. Sec.	2	HSL 1158	Ballet III	1
HSL 1162	Rhythmic Analy.	1	HSL 1155	Mod. Dance III	1
HSL 1157	Ballet II	1	HSL 1868	Directed Tchg. I	1
HSL 1160	Jazz Dance II	1			

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
PSY 1111	Fnd. of Psy.	4	—	Humanities Elective	4
HSL 1611	Kinesiology	4	HSL 1606	Motor Learning	4
HSL 1615	Crit. Teaching	4	—	Elective	4
HSL 1634	Laban Move. An.	2	HSL 1626	Measurement & Eval.	4
HSL 1325	Reh. & Performance	1	HSL —	Tech./Skill El.	1
HSL 1152	Folk & Sq. Dance	1	HSL 1161	Jazz Dance III	1
HSL 1321	Modern Dance IV	1			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1463	Overview Dis.	4	HSL 1605	Basic A.T.	3
—	Elective	4	HSL 1616	Curric. Dev.	3
—	Elective	4	—	Elective	4
HSL 1632	Dance 20th C.	4	—	Elective	4
HSL 1104	Ballroom Dance	1	HSL —	Tech./Skill El.	1
HSL 1869	Dir. Teaching II	1	HSL 1267	Tchg. Fk./Sq./Blrm. Dnc.	2

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HSL 1623	Sprvsd. St. Tch.	12	—	Humanities El.	4
			HSL 1865	Special Prob.	3
			—	Elective	4
			—	Elective	4

180 Q.H. = Minimum graduation requirement

Specimen Program in Physical Therapy**First Year**

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
PSY 1111	Fnd. of Psych. I	4	MTH 1107	Func. & Basic Calc.	4	CHM 1112	Gen. Chem.	5
MTH 1106	Fund. of Math.	4	CHM 1111	Gen. Chem.	5	BIO 1141	Bas. Ani. Bio II	4
BIO 1140	Bas. Ani. Bio. I	4	ENG 1110	Fresh. Eng. I	4	ENG 1111	Fresh. Eng. II	4

Quarter 1, 2, or 3

No.	Course	Q.H.
HSL 1254	First Aid	2
PTH 1114	In. Phys. Thpy. I	2
HSL 1281	Cur. Is. in Hlth.	4

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
PHY 1201	Phys. Life Sci. I	4	PHY 1202	Phys. Life Sci. II	4
PHY 1501	Phys. Lab. L.S. I	1	BIO 1254	Hum. Physiology II	4
BIO 1253	Hum. Physiology I	4	BIO 1255	Hum. Anat.	4
HSL 1260	Prp. Motor. Dev.	4	PSY 1112	Fnd. Psych. II	4
PTH 1114	In. Phys. Thpy. I (transfers only)	2	PTH 1115	In. Phys. Thpy. II	2
—	Elective	4			

Students should recognize that they must satisfy computer literacy requirement either through INT 1100 or through competency exam before progressing to the middler year.

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
PTH 1310	Clin. Gross Anat.	6	PTH 1330	Clin. Kinesiology	5
PTH 1315	Phys. for Ph. Thr.	5	PTH 1335	Phys. Thrpy. II	3
PTH 1320	Phys. Thrpy. I	2	PTH 1340	Phys. Thrpy. III	4
PTH 1325	Clin. Medicine I	4	PTH 1345	Clin. Medicine II	3
			PTH 1352	Psysoc. Asp. of Ill.	3

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
PTH 1355	Phys. Thrpy. IV	3	PTH 1375	Phys. Thrpy. VII	2
PTH 1360	Phys. Thrpy. V	4	PTH 1380	Super Clin. Educ.	5
PTH 1366	Neuroanatomy	5	PTH 1385	Clinic. Medicine III	3
PTH 1370	Clin. Seminar	2	PTH 1390	Phys. Thrpy. VI	3
			PTH 1395	Phys. Thrpy. V cont.	1

Specimen Program in Human Services

Quarter 1	ED1100, Education and Social Science, or SOC1100, Introduction to Sociology; ENG1110, Freshman English I; POL 1111, Introduction to American Government; college distribution requirement.
Quarter 2	ED1302, Introduction to Human Services Professions; ED 1102, Human Development I or PSY1111, Foundations of Psychology I; ENG1111, Freshman English II; designated elective.
Quarter 3	ED1103, Human Development II, or PSY1112, Foundations of Psychology II; ECN1116, Principles of Microeconomics, or another approved economics course; college distribution requirement; Human Services specialization course.
Bachelor of Science	<p><i>Prerequisite Courses:</i> ED1100, Education and Social Science, or SOC1100, Introduction to Sociology; ED1302, Introduction to Human Services Professions; ED1102, Human Development I, or PSY III, Foundations of Psychology I; ED1103 Human Development II, or PSY1112, Foundations of Psychology II; POL1111, Introduction to American Government; ECN1116, Principles of Microeconomics, or another approved economics course.</p> <p><i>Core Courses:</i> ED1307, Introduction to Education Statistics, or SOC1320, Introduction to Statistical Analysis, or PSY1211, Statistics in Behavioral Science I; SOC1324, Human Services Research and Evaluation, or PSY1511, Experimental Design in Psychology, or SOC1321, Research Methods I; SOC1240, Sociology of Human Services Organizations; PSY1272, Personality I; PSY 1373, Abnormal Psychology; ED1300, Education and Psychosocial Development; ED1301; Education Applications of Social Psychology, or ED1317, Seminar on Group Process, or SPC1330, Interpersonal Communication I, or SPC1338, Group Discussion; CRS1310, Intervention Strategies; INT1333, Senior Seminar in Human Services.</p> <p><i>Specified Electives:</i> Three courses selected from a selected list relating to poverty and welfare, race relations, and special needs.</p> <p><i>Human Services Fieldwork:</i> INT1330, Field Experience in Human Services I; INT1331, Field Experience in Human Services II.</p> <p><i>Human Services Specialization:</i> Five courses in an area of human services, selected in consultation with an academic advisor.</p> <p><i>University and College requirements:</i> Computer literacy requirement; Freshman English I and II; Middler Year Writing Requirement; distribution requirements of four math/science and four humanities courses; eleven Boston-Bouvé College courses taken in the general area of education (including required courses).</p>

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
PTH 1400	Admin.	4	PTH 1415	Superv. Clin. Ed. II	
PTH 1405	Res. Phys. Thrpy.	4			
PTH 1411	Phys. Thrpy. VIII	4			
_____	Elective	4			
_____	Elective	4			

In Quarters 10 and 11 the class is divided in half, with half of the class on campus and half in Supervised Clinical Education II for one quarter each.

Quarter 12		
No.	Course	Q.H.
PTH 1420	PT Hlth. Care Sys.	3
PTH 1426	Fr. As. Eld. Cli.	3
PTH 1450	Invest. Studies	6
_____	Elective	4

Specimen Programs in Teacher Preparation**General Requirements:**

Students must complete the following requirements to earn a Bachelor of Science degree in Education:

1. Distribution requirements with a minimum of sixteen quarter hours each of these areas: humanities, mathematics/sciences, and social sciences.
2. Major course requirements are listed on pages 00-00. (In addition to those courses required of all Elementary Education majors, students in this major must take designated courses in one area of emphasis chosen from the humanities, social sciences, mathematics/sciences, and language/reading or a minor in special education.)
3. Designated electives offered by the College of Arts and Sciences and the Boston Bouvé College of Human Development Professions. These electives, which depend on the particular program of study, are in the areas of English, history, drama/speech, political science, economics, earth science, and the foundations of education.

There is no language requirement.

As early as possible students should discuss their curriculum questions and academic needs with a representative of the Dean's Office or a faculty advisor.

Specimen Program in Early Childhood Education (K-3)**Freshman Year (48 Q.H.)**

HST 1101	Western Civ. I
ENG 1110	Freshman English I
ED 1100	Education and Social Science
ED 1101	Education for the Future
GEO ____	Earth Science (Elective)
HST 1102	Western Civ. II
ECN 1115	Economics
GEO ____	Earth Science (Elective)
POL ____	Political Science (Elective)
ED 1105	Day Care and Nursery Schools
ENG 1111	Freshman English II
ENG ____	English Elective

Sophomore Year (32 Q.H.)

ED 1104	Analysis of the Instructional Process
ED 1102	Human Development and LRN. I
CRS 1200	Introduction to Special Education
HSL 1265	Early Childhood Development
SLA 1101	Introduction to Speech and Hearing
ED 1106	Creative Expression in Children
ENG ____	English Elective
_____	Humanities Elective

Middler Year (34 Q.H.)

ED 1400	Fundamentals of Reading I
ED 1408	Elementary School Math
ED 1405	Literature and Learning Material
ED 1409	Elementary School Science
ED 1402	Fundamentals of Reading II (6 Q.H.)
ED ____	Educational Humanities Elective
HST ____	History Elective
_____	Elective

Senior Year (32 Q.H.)

_____	Drama or Speech Elective
SLA 1300	Semantics and Syntax
ED 1417	Student Teaching (8 Q.H.)
HST ____	History Elective
_____	Math/Science Elective
_____	Elective
_____	Elective

Junior Year (31 Q.H.)

ED 1406	Elementary Education Curriculum I
ED 1407	Elementary Education Curriculum II
ED 1306	Measurement and Evaluation
COP 1353	Professional Development (1 Q.H.)
ED 1304	Language and Cognition
ED 1318	Seminar in Early Childhood
ED 1416	Field Placement (2 Q.H.)
_____	Math/Science Elective
POL ____	Political Science Elective

177 Q.H. = Minimum graduation requirement

Specimen Program in Elementary Education (Humanities Emphasis)

Freshman Year (48 Q.H.)

HST 1101	Western Civ. I
ENG 1110	Freshman English I
ED 1100	Education and Social Science
ED 1101	Education for the Future
GEO ____	Earth Science Elective
HST 1102	Western Civ. II
ECN 1115	Economics
_____	Computer Science Elective
POL ____	Political Science Elective
ENG 1111	Freshman English II
ENG ____	English Elective
_____	Elective

Sophomore Year (32 Q.H.)

ED 1104	Analysis of the Instructional Process
ED 1102	Human Development I
CRS 1200	Introduction to Special Education
ED 1103	Human Development II
ENG ____	English Elective
_____	Humanities Elective
HST ____	History Elective
ED ____	Educational Sociology Elective

Middler Year (34 Q.H.)

ED 1400	Fundamentals of Reading I
ED 1408	Elementary School Math
ED 1405	Literature and Learning Materials
ED 1409	Elementary School Science
ED 1402	Fundamentals of Reading II (6 Q.H.)
ED ____	Educational Humanities Elective
POL ____	Political Science Elective
_____	Humanities Elective

Junior Year (34 Q.H.)

ED 1406	Elementary Education Curriculum I
ED 1407	Elementary Education Curriculum II
ED 1306	Measurement and Evaluation
COP 1353	Professional Development (1 Q.H.)
HSL 1151	Movement Education (1 Q.H.)
HST ____	History Elective
_____	Drama
_____	or
_____	Speech Elective
_____	Math/Science Elective
_____	Humanities Elective
_____	Humanities Elective

Senior Year (32 Q.H.)

ED 1417	Student Teaching (8 Q.H.)
_____	Math/Science Elective
_____	Humanities Elective
_____	Humanities Elective
_____	Humanities Elective
_____	Humanities Elective
_____	Elective

180 Q.H. = Minimum graduation requirement

Specimen Program in Elementary Education (Language/Reading Emphasis)

Freshman Year (48 Q.H.)

HST 1101	Western Civ. I
ENG 1110	Freshman English I
ED 1100	Education and Social Science
ED 1101	Education for the Future
GEO ____	Earth Science Elective
HST 1102	Western Civ. II
ECN 1115	Economics
_____	Computer Science Elective
POL ____	Political Science Elective
ENG 1111	Freshman English II
ENG ____	English Elective
_____	Elective

Junior Year (34 Q.H.)

ED 1406	Elementary Education Curriculum I
ED 1407	Elementary Education Curriculum II
ED 1306	Measurement and Evaluation
COP 1353	Professional Development (1 Q.H.)
HSL 1151	Movement Education (1 Q.H.)
HST ____	History Elective
_____	Drama
_____	or
_____	Speech Elective
ED 1403	Remedial Reading
ED 1404	Linguistics and Reading
_____	Math/Science Elective

Sophomore Year (32 Q.H.)

ED 1104	Analysis of the Instructional Process
ED 1102	Human Development I
CRS 1200	Introduction to Special Education
ED 1103	Human Development II
ENG ____	English Elective
_____	Humanities Elective
HST ____	History Elective
ED ____	Educational Sociology Elective

Senior Year (32 Q.H.)

ED 1417	Student Teaching (8 Q.H.)
_____	Language/Reading
_____	Language/Reading
_____	Math/Science Elective
_____	Language/Reading Elective
_____	Language/Reading Elective
_____	Elective

Middler Year (34 Q.H.)

ED 1400	Fundamentals of Reading I
ED 1408	Elementary School Math
ED 1405	Literature and Learning Materials
ED 1409	Elementary School Science
ED 1402	Fundamentals of Reading II (6 Q.H.)
ED ____	Educational Humanities Elective
POL ____	Political Science Elective
_____	Elective

180 Q.H. = Minimum graduation requirement

**Specimen Program in Elementary Education
(Social Sciences Emphasis)**

Freshman Year (48 Q.H.)

HST 1101	Western Civ. I
ENG 1110	Freshman English I
ED 1100	Education and Social Science
ED 1101	Education for the Future
GEO ____	Earth Science Elective
HST 1102	Western Civ. II
ECN 1115	Economics
_____	Computer Science Elective
POL ____	Political Science Elective
ENG 1111	Freshman English II
ENG ____	English Elective
_____	Elective

Junior Year (34 Q.H.)

ED 1406	Elementary Education Curriculum I
ED 1407	Elementary Education Curriculum II
ED 1306	Measurement and Evaluation
COP 1353	Professional Development (1 Q.H.)
HSL 1151	Movement Education (1 Q.H.)
HST ____	History Elective
_____	Drama
_____	or
_____	Speech Elective
_____	Math/Science Elective
_____	Social Science Elective
_____	Social Science Elective

Sophomore Year (32 Q.H.)

ED 1104	Analysis of the Instructional Process
ED 1102	Human Development I
CRS 1200	Introduction to Special Education
ED 1103	Human Development II
ENG ____	English Elective
_____	Humanities Elective
HST ____	History Elective
_____	Educational Sociology Elective

Senior Year (32 Q.H.)

ED 1417	Student teaching (8 Q.H.)
_____	Math/Science Elective
_____	Social Science Elective
_____	Social Science Elective
_____	Social Science Elective
_____	Social Science Elective
_____	Elective

Middler Year (34 Q.H.)

ED 1400	Fundamentals of Reading I
ED 1408	Elementary School Math
ED 1405	Literature and Learning Materials
ED 1409	Elementary School Science
ED 1402	Fundamentals of Reading II (6 Q.H.)
ED ____	Educational Humanities Elective
POL ____	Political Science Elective
_____	Social Science Elective

180 Q.H. = Minimum graduation requirement

**Specimen Program in Elementary Education
(Minor in Special Education)**

Freshman Year (48 Q.H.)

HST 1101	Western Civ. I
ENG 1110	Freshman English I
ED 1100	Education and Social Science
ED 1101	Education for the Future
GEO ____	Earth Science Elective
HST 1102	Western Civ. II
ECN 1115	Economics
_____	Computer Science Elective
POL ____	Political Science Elective
ENG 1111	Freshman English II
ENG ____	English Elective
ED ____	Educational Sociology Elective

Sophomore Year (32 Q.H.)

ED 1104	Analysis of the Instructional Process
ED 1102	Human Development I
CRS 1200	Introduction to Special Education
ED 1103	Human Development II
ENG ____	English Elective
SLA 1101	Introduction Speech and Hearing
ED 1405	Literature and Learning Materials
_____	Humanities Elective

Middler Year (34 Q.H.)

ED 1400	Fundamentals of Reading I
ED 1408	Elementary School Math
CRS 1304	Soc-Psych Dynamics Family Life
ED 1402	Fundamentals of Reading II
ED 1409	Elementary School Science
CRS 1305	Psych of Mentally Retarded
CRS 1300	Intro Learning Disabilities
PSY 1373	Abnormal Psych I

Senior Year (32 Q.H.)

ED 1417	Student Teaching (8 Q.H.)
ED 1404	Linguistics and Reading
_____	History Elective
_____	Educational Humanities Elective
_____	Math/Sci Elective
CRS 1317	Special Education Practicum (8 Q.H.)

Junior Year (34 Q.H.)

ED 1406	Elementary Ed Curriculum I
ED 1403	Remedial Reading
CRS 1301	Diagnosis in Special Ed
COP 1353	Professional Development (1 Q.H.)
ED 1407	Elementary Ed Curriculum II
ED 1306	Measurement and Evaluation
HSL 1151	Movement Education (1 Q.H.)
CRS 1030	Intro Emotional Disturbance
CRS 1302	Methods/Materials in Special Ed
_____	Drama or Speech Elective

180 Q.H. = Minimum graduation requirement

Specimen Program in Speech and Hearing

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
ENG 1110	Fresh. English I	4	ENG 1111	Fresh. Eng. II	4	SLA 1101	Intro. Speech	4
ED 1100	Ed. & Soc. Sci.	4	SLA 1100	Bs. Man. Comm.	4	_____	Elective*	4
INT 1100	Beg. Comp. Use	4	_____	Elective*	4	_____	Elective*	4
_____	Elective	4	_____	Elective*	4	_____	Elective*	4

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
ED 1307	Intro. Ed. Stat.	4	ED 1102	Hum. Dev. I	4
SLA 1200	Hearing Sci.	4	SLA 1201	Anat. Voc. Mech.	4
CRS 1200	Intro. Spec. Ed.	4	_____	Elective*	4
_____	Elective*	4	_____	Elective*	4

Third Year

Quarter 6			Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
SLA 1301	Dev. Phonology	4	SLA 1400	Speech Sci.	4	SLA 1402	Diagnostic Tech.	4
PSY 1272	Personality I	4	ED 1400	Fundn. Read. I	4	SLA 1403	Orient. Clin. Prac.	4
SLA 1300	Dev. Semantics	4	SLA 1401	Fluency Dis.	4	SLA 1404	Intro. Psychoacousts.	4
BIO 1181	Hum. Orgnsm.	4	COP 1353	Prof. Dev.	1	_____	Elective*	4
			_____	Elective*	4			

Fifth Year

Quarter 10			Quarter 10a			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
PSY 1373	Abn. Psych.	4	SLA 1501	Clin. Prac.	8	PSY 1374	Abn. Psych. II	4
SLA 1500	Psychoacous. Lab.	4					Elective*	4
	Elective*	4						
	Elective*	4						

177 Q.H. = Minimum graduation requirement.

*Electives must include: 8 Q.H. in Ed. Soc.; 4 Q.H. in Ed. Psych.; 16 Q.H. in Liberal Arts Humanities; 4 Q.H. in Ed.; and 8 Q.H. in Lib. Arts Math/Sci.

College of Business Administration

Specimen Program for First Three Quarters

The courses taken in the first three quarters are the same for all concentrations.

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
ACC 1111	Acct. Prin. I	4	ACC 1112	Acct. Prin. II or	4	MGT 1415	Intro. Busn.	4
MTH 1113	Math. Busnes. or	4	MTH 1113	Math. Busnes. or	4		Lib. Electives	8
MTH 1114	Fund. Math.	4	MTH 1114	Fund. Math	4		Bus. Elective	4
ECN 1105	Econ. Princ.	4		Lib. Elective	4			
ENG 1110	Fresh. Eng. I	4	ECN 1106	Econ. Prin.	4			
	A & S Elective		ENG 1111	Fresh. Eng. II	4			

During the five-year program at least one elective must be taken from the approved International elective list.

Accounting

- Quarter 4** MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; two nonbusiness electives.
- Quarter 5** MSC 1201, Business Statistics 2; three nonbusiness electives.
- Quarter 6** ACC 1331, Intermediate Accounting 1; HRM 1431, Complex Organizations; MKT 1435, Introduction to Marketing; MSC 1433, Business Modeling.
- Quarter 7** ACC 1332, Intermediate Accounting 2; ACC 1339, Cost Accounting 1; HRM 1432, Organizational Behavior; FIN 1438, Introduction to Finance.
- Quarter 8** ACC 1340, Cost Accounting 2; ACC 1343, Intermediate Accounting 3; non-business elective; open elective.
- Quarter 9** MGT 1446, Managing Social Issues; ACC 1348, Accounting Theory and Practice, or ACC 1349, Accounting Planning and Control; MSC 1441, Operations Management; open elective.
- Quarter 10** MGT 1450, Business Policy; three open electives.
- Quarter 11** Three open electives; nonbusiness elective.

Entrepreneurship and New Venture Management

- Quarter 4** MSC 1200, Business Statistics 1, MSC 1226, Introduction to Data Processing; two nonbusiness electives.
- Quarter 5** MSC 1201, Business Statistics 2; three nonbusiness electives.
- Quarter 6** HRM 1431, Complex Organizations; ENT 1350, Small Business Management; MKT 1435, Introduction to Marketing; MSC 1433, Business Modeling.
- Quarter 7** HRM 1432, Organizational Behavior; FIN 1438, Introduction to Finance; two open electives.
- Quarter 8** ENT 1344, Operations Analysis and Venture Capital; two nonbusiness electives; open elective.

Quarter 9	FIN 1770, Small Business Finance; MGT 1446, Managing Social Issues; MSC 1441, Operations Management; open elective.
Quarter 10	MGT 1450, Business Policy; ENT 1352, New Venture Creation; nonbusiness elective; open elective.
Quarter 11	ENT 1358, Small Business Institute Field Project; two open electives.

Finance and Insurance

Quarter 4	MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; two nonbusiness electives.
Quarter 5	MSC 1201, Business Statistics 2; three nonbusiness electives.
Quarter 6	FIN 1438, Introduction to Finance; FIN 1333, Money and Business Activity; HRM 1431, Complex Organizations; nonbusiness elective.
Quarter 7	FIN 1335, Managerial Finance; MKT 1435, Introduction to Marketing; HRM 1432, Organizational Behavior; MSC 1433, Business Modeling.
Quarter 8	FIN 1346, Investment Management; Finance elective; MSC 1441, Operations Management; open elective.
Quarter 9	MGT 1446, Managing Social Issues; Finance elective; nonbusiness elective; open elective.
Quarter 10	MGT 1450, Business Policy; Finance elective; two open electives.
Quarter 11	Four open electives.

Nonconcentration

Quarter 4	MSC 1200, Business Statistics 1; three nonbusiness electives.
Quarter 5	MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; two nonbusiness electives.
Quarter 6	HRM 1431, Complex Organizations; FIN 1438, Introduction to Finance; MSC 1433, Business Modeling; open elective.
Quarter 7	HRM 1432, Organizational Behavior; MKT 1435, Introduction to Marketing; business elective; open elective.
Quarter 8	MSC 1441, Operations Management; two business electives; open elective.
Quarter 9	MGT 1446, Managing Social Issues; business elective; nonbusiness elective; open elective.
Quarter 10	MGT 1450, Business Policy; business elective; nonbusiness elective; open elective.
Quarter 11	Business elective; three open electives.

Human Resources Management

Quarter 4	MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; two nonbusiness electives.
Quarter 5	MSC 1201, Business Statistics 2; three nonbusiness electives.
Quarter 6	HRM 1431, Complex Organizations; MKT 1435, Introduction to Marketing; MSC 1433, Business Modeling; open elective.
Quarter 7	HRM 1332, People and Productivity; HRM 1432, Organizational Behavior; FIN 1438, Introduction to Finance; open elective.
Quarter 8	HRM 1348; Reward Systems; HRM 1439, Assessment of Prospective Employees; nonbusiness elective; open elective.
Quarter 9	MGT 1446, Managing Social Issues; MSC 1441, Operations Management; Human Resources Management elective; open elective.
Quarter 10	HRM 1345, Contemporary Labor Issues; MGT 1450, Business Policy; Human Resources Management elective; open elective.
Quarter 11	Nonbusiness elective; three open electives.

International Business Administration

Quarter 4	MSC 1200, Business Statistics 1; three nonbusiness electives.
Quarter 5	MSC 1201, Business Statistics 2; two nonbusiness electives.
Quarter 6	HRM 1431, Complex Organizations; INB 1338, Introduction to International Business; FIN 1438, Introduction to Finance; open elective.
Quarter 7	HRM 1432, Organizational Behavior; MKT 1435, Introduction to Marketing; MSC 1433, Business Modeling; open elective.
Quarter 8	MSC 1441, Operations Management; business elective; International nonbusiness elective; open elective.
Quarter 9	MGT 1446, Managing Social Issues; International nonbusiness elective; two open electives.
Quarter 10	MGT 1450, Business Policy; International nonbusiness elective; two open electives.
Quarter 11	INB 1352; Seminar in International Business; International business elective; two open electives.

Management

Quarter 4	MSC 1200, Business Statistics 1; three nonbusiness electives.
Quarter 5	MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; two nonbusiness electives.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1431, Complex Organizations; MSC 1433, Business Modeling; open elective.
Quarter 7	MKT 1435, Introduction to Marketing; HRM 1432, Organizational Behavior; ACC 1330, Cost Accounting; HRM 1332, People and Productivity.
Quarter 8	MGT 1345, Legal Aspects of Business; MSC 1441, Operations Management; business elective; open elective.
Quarter 9	MGT 1446, Managing Social Issues; business elective; nonbusiness elective; open elective.
Quarter 10	MGT 1450, Business Policy; nonbusiness elective; two open electives.
Quarter 11	Business elective; three open electives.

Marketing

Quarter 4	MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; two nonbusiness electives.
Quarter 5	MSC 1201, Business Statistics 2; three nonbusiness electives.
Quarter 6	MKT 1435, Introduction to Marketing; HRM 1431, Complex Organizations; nonbusiness elective; open elective.
Quarter 7	FIN 1438, Introduction to Finance; HRM 1432, Organizational Behavior; MKT 1331, Marketing Management; MSC 1433, Business Modeling.
Quarter 8	MKT 1341, Marketing Research; Marketing elective; nonbusiness elective; open elective.
Quarter 9	MGT 1446, Managing Social Issues; MSC 1441, Operations Management; Marketing elective; open elective.
Quarter 10	MKT 1351, Competitive Strategies; MGT 1450, Business Policy; two open electives.
Quarter 11	Marketing elective; three open electives.

Transportation and Physical Distribution Management

Quarter 4	MSC 1200, Business Statistics 1; three nonbusiness electives.
Quarter 5	MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; two nonbusiness electives.
Quarter 6	HRM 1431, Complex Organizations; FIN 1438, Introduction to Finance; TRN 1333, Introduction to Transportation; open elective.

Quarter 7	HRM 1432, Organizational Behavior; Transportation elective; MKT 1435, Introduction to Marketing; TRN 1335, Current Issues in Transportation Policy; MSC 1433, Business Modeling.
Quarter 8	MSC 1441, Operations Management; Transportation elective; nonbusiness elective; open elective.
Quarter 9	MGT 1446, Managing Social Issues; TRN 1344, Physical Distribution Management; nonbusiness elective; open elective.
Quarter 10	MGT 1450, Business Policy; Transportation elective; two open electives.
Quarter 11	TRN 1353, Seminar in Transportation; three open electives.

College of Computer Science

Specimen Program in Computer Science

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
COM 1100	Fund. Comp. Sci.	4	COM 1101	Algor. & Data Struc. I	4	MTH 1125	Calculus III	4
MTH 1123	Calculus I	4	MTH 1124	Calculus II	4	PHY 1241	Physics I	4
ENG 1110	Fresh. Engl. I	4	MTH 1137	Discr. Math I	4	COM 1201	Algor. & Data Struc. II	4
HST 1101	Western Civ.	4	HST 1102	Western Civ.	4	ENG 1111	Fresh. Engl. II	4
			COM 1113	COBOL Lab or	1	COM 1110	FORTTRAN Lab	1
			COM 1110	FORTTRAN Lab	1	PHY 1521	Physics Lab I	1

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
PHY 1242	Physics II	4	PHY 1243	Physics III	4
COM 1130	Comp Org & Prog I	4	COM 1131	Comp Org & Prog II	4
MTH 1223	Calculus IV	4	MTH 1237	Discrete Math II	4
PHY 1522	Physics Lab II	1	COM 1114	C. Lang. Lab	1
	Elctv/Subarea (1)	4		Elctv/Subarea (2)	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1191	Intro Digital Comp I	4	ECE 1192	Intro Digital Comp II	4
	Elctv/Subarea (3)	4	ENG 1125	Tech. Writing I	4
COM 1102	Funct Prog & Appl	4	COM 1205	Softwr Dsgn & Dev	4
COM 1310*	File Struct	4	COM 1350	Automata Lang	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
COM 1330*	Systems Prog	4	SOC 1485	Computers & Soc.	4
MTH 1301	Linear Algebra	4	MTH 1387	Probability	4
	C.S. Elective (1)	4		C.S. Elective (2)	4
	Elctv/Subarea (4)	4		Elctv/Subarea (5)	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
COM _____	C.S. Elective (3)	4	COM _____	C.S. Elective (5)	4
_____	Elctv/Subarea (4)	4	COM 1620	C.S. Seminar	1
_____	Elctv/Subarea (6)	4	_____	Elctv/Subarea (8)	4
_____	Elctv/Subarea (7)	4	_____	Elctv/Subarea (9)	4
			_____	Elctv/Subarea (10)	4

Note: Three of the Computer Science electives must form a complete track.

*A student wishing to complete the systems track may reverse the order of these two courses.

Computer Science Major Requirements Checklist

Computer Science

Level I			Level II (select eight courses, including at least one complete track)		
No.	Course	Q.H.	No.	Course	Q.H.
COM 1100	Fund Comp. Sci	4	Data Base Track		
COM 1101	Algor. & Data Struc I	4	COM 1310	File Structures	4
COM 1102	Funct Prog & Appl	4	COM 1315	Data Base Mngmt. I	4
COM 1110	FORTTRAN Lab	1	COM 1316	Data Base Mngmt. II	4
COM 1111	DCL Lab	1	Systems Track		
COM 1113	COBOL Lab	1	COM 1330	Systems Prgrmmg.	4
COM 1114	C Lab	1	COM 1335	Operating Systems I	4
COM 1201	Algor & Data Struc II	4	COM 1336	Operating Systems II	4
COM 1205	Software Design	4	Languages Track		
COM 1130	Comp Org & Prog I	4	COM 1350	Automata & Form. Lan.	4
COM 1131	Comp Org & Prog II	4	COM 1355	Compiler Design I	4
			COM 1356	Compiler Design II	4
			Electives		
			COM 1358	Anal. of Prog. Lang.	4
			COM 1370	Computer Graphics	4
			COM 1390	Anlys. of Algorithms	4
			COM 1410	Artificl. Intelligence	4
			COM 1420	Interactive Systems	4
			Seminar (To be taken during senior year)		
			COM 1620	Computer Sci. Sem.	1

Mathematics

Level I			Level II		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1123	Calculus I	4	MTH 1387	Probability	4
MTH 1124	Calculus II	4	MTH 1301	Linear Algebra	4
MTH 1125	Calculus III	4			
MTH 1223	Calculus IV	4			
MTH 1137	Discrete Math. I	4			
MTH 1237	Discrete Math. II	4			

Physics

Level II		
No.	Course	Q.H.
PHY 1241	Physics I	4
PHY 1242	Physics II	4
PHY 1243	Physics III	4

Electrical Engineering

Level II		
No.	Course	Q.H.
ECE 1191	Intro Digital Comp I	4
ECE 1192	Intro Digital Comp II	4

Other Subject Areas

Level II		
No.	Course	Q.H.
ENG 1110	Freshman Eng. I	4
ENG 1111	Freshman Eng. II	4
ENG 1125	Technical Writing	4
HST 1101	Western Civ. I	4
HST 1102	Western Civ. II	4
SOC 1485	Computers & Soc.	4

Electives (total 20 Q.H.)

Subarea (total 20 Q.H.)

Computer Science Requirements

Requirements for Computer Science Majors

Computer Science Courses

Computer Science courses fall into one of two levels. Level I consists of Courses: COM 1100, COM 1101, COM 1102, COM 1130, COM 1131, COM 1201, COM 1205; Labs: COM 1110, COM 1113, and COM 1111 or COM 1114.

All Level I courses and labs are required for the major. The rest of the computer science courses are in Level II. Majors must take eight Level II courses; three of these must form one of the following tracks: Data Base Track COM 1310, COM 1315, COM 1316; Systems Track COM 1330, COM 1335, COM 1336; Languages Track COM 1350, COM 1355, COM 1356.

Finally, majors must take the one-credit seminar COM 1620 during their senior year.

Mathematics Courses

Major must take the following eight mathematics courses; Level I Calculus MTH 1123, MTH 1124, MTH 1125, and MTH 1223; Discrete Mathematics MTH 1137, MTH 1237.

Physics Courses

Level II Probability MTH 1387; Linear Algebra MTH 1301.

Majors must take the following three physics courses: Physics PHY 1241, PHY 1242, and PHY 1243.

Electrical Engineering Courses

Majors must take the following two electrical engineering courses: Digital Computers ECE 1191 and ECE 1192.

Majors must take the following six courses: English ENG 1110 and ENG 1111; Technical Writing ENG 1125; Computers and Society SOC 1485; Western Civilization HST 1101 and HST 1102.

Other Subject Areas

In addition, majors must take at least five courses in a selected subarea of humanities, science, social science, business, education, or engineering. The College of Computer Science will provide lists of suitable courses in a variety of subareas.

Majors have five free electives. However, at least two courses among the total ten (five in the subarea and five electives) must be in social sciences or humanities.

NOTES:

1. The total number of credit hours required for graduation is 179.

2. During the first two years, students should take all Level I computer science and mathematics courses, physics, English, Western Civilization, and one other course. The three computer science track courses should be taken in the third and fourth year. See the Specimen Program for details on program arrangement.

Requirements for Computer Science Minors

In addition to fulfilling the requirements of their major department, students who wish to minor in computer science must take the following four courses: COM 1100, COM 1101, COM 1130, COM 1201. They must also take three additional four-quarter-hour courses with the COM prefix.

College of Criminal Justice

Specimen Program in Criminal Justice

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
CJ 1101	Admn. Crim. Just.	4	ECN 1116	Prin. Microecon.	4	SOC 1100	Intro. Soc.	4
ECN 1115	Prin. Macroecon.	4	POL 1111	Intro. Amer. Gov.	4	PSY 1112	Fnd. Psych. II	4
POL 1110	Intro. Politics	4	ENG 1110	Fresh. Eng. I	4	ENG 1111	Fresh. Eng. II	4
PSY 1111	Fnd. Psych I	4	CJ 1112	ISSCJ Admins.	4	CJ 1151	Law & Legl. Pro.	4

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
POL 1318	State & Loc. Gov.	4	_____	Math/Sci. Require.	4
CJ 1251	Crim. Law	4	_____	Non-Crim. Jus. Elctv.	4
CJ 1201	Criminology	4	CJ _____	Crim. Jus. Elctv.	4
_____	Math/Sci. Require.	4	CJ 1252	Crim. Due Proc.	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
CJ _____	Crim. Jus. Elctv.	4	CJ _____	Crim. Jus. Elctv.	4
ENG 1350	Intrmdte. Writing	4	_____	Non-Crim. Jus. Elctv.	4
CJ 1451	Crim. Jus. Res.	4	_____	Non-Crim. Jus. Elctv.	4
HST 1101	Western Civ. I	4	HST 1102	Western Civ. II	4

Fourth Year

Fifth Year

Quarters 8-11					
No.	Course	Q.H.	No.	Course	Q.H.
CJ _____	Crim. Jus. Elctvs.	24	_____	Non-Crim. Jus. Elctv.	36

College of Engineering

Specimen Program in Chemical Engineering

All courses in Chemical Engineering must be taken in sequence shown.

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1123	Calculus	4	MTH 1124	Calculus	4	MTH 1128	Calculus	4
PHY 1221	Physics. for Eng. I	4	PHY 1222	Physics for Eng. II	4	PHY 1223	Physics for Eng. III	4
GE 1100	Comp. for Eng.	4	GE 1110	Eng. Graph. and Des.	4	CHM 1132	Gen. Chem.	4
ENG 1111	Fresh. Eng. II	4	CHM 1131	Gen. Chem.	4	ENG 1113	Gr. Th. Lit.	4
PHY 1521	Physics Lab for Eng. I	1	PHY 1522	Physics Lab for Eng. II	1	CHM 1138	Chem. Lab	1

First-year pattern of two-term courses may vary according to assigned section.

Second Year

Quarter 4				Quarter 5			
No.		Course	Q.H.	No.		Course	Q.H.
CHE 1201		Chm. Eng. Clc. I	4	CHE 1211		Chem. Eng. Thrms. I	4
CHE 1205		Computation Lab	2	CHM 1272		Org. Chm. II (& Lab)	5
CHM 1271		Organic Chem. I	3	MTH 1228		Calculus	4
MTH 1227		Calculus	4			Soc. Sc./Hm. Elctv.	4
		Soc. Sc./Hm. Elctv.	4				

Third Year

Quarter 6				Quarter 7			
No.		Course	Q.H.	No.		Course	Q.H.
CHE 1300		Chm. Eng. Clc. II	4	CHE 1310		Chm. Eng. Therm. II	4
CHM 1381		Phys. Chem. I	3	CHE 1320		Momentum Trnsprt.	4
CHM 1394		Exp. Phys. Chm. I	2	CHM 1382		Physical Chem. II	3
MTH 1225		Math Analysis I	4	CHM 1395		Exp. Phys. Chem. II	2
ENG 1125		Tech. Writ. I or		ENG 1125		Tech. Writ. I or	
		Soc. Sc./Hm. Elctv.	4			Soc.Sc./Hm. Elctve.*	4

Fourth Year

Quarter 8				Quarter 9			
No.		Course	Q.H.	No.		Course	Q.H.
CHE 1401		Transp. Phen. I	4	CHE 1402		Transp. Phen. II	4
CHE 1410		Exprmntl. Meth. I	4	CHE 1411		Exprmntl. Methods II	4
CHE 1310		Chm. Eng. Thrms. II	4	CHE 1421		Chem. Eng. Kinetics	4
		Soc. Sc./Hm. Elctv.	4			Soc. Sc./Hm. Elctv.	4

Fifth Year

Quarter 10*				Quarter 11*			
No.		Course	Q.H.	No.		Course	Q.H.
CHE 1501		Process Design I	6	CHE 1502		Process Design II	6
CHE _____		Chm. Eng. Elect.	4	CHE _____		Chm. Eng. Elective	4
CHE _____		Chm. Eng. Elect.	4	CHE _____		Chm. Eng. Elective	4
		Soc. Sc./Hm. Elctv.	4			Soc. Sc./Hm. Elctv.	4

Quarters 4, 6, 8, and 10 offered Fall and Winter. Quarters 5, 7, and 9 offered Spring and Summer.

*Quarters 10 and 11 must be approved by department adviser.

Specimen Program in Civil Engineering**First Year**

Quarter 1				Quarter 2				Quarter 3			
No.		Course	Q.H.	No.		Course	Q.H.	No.		Course	Q.H.
GE 1100		Comp. for Engr.	4	GE 1110		Engr. Graph. and Des.	4	MTH 1128		Calculus III	4
MTH 1123		Calculus	4	MTH 1124		Calculus II	4	PHY 1223		Physics III	4
PHY 1221		Physics I	4	PHY 1222		Physics II	4	CHM 1132		Gen. Chem.	4
ENG 1111		Fresh. Engr. II	4	CHM 1131		Gen. Chem.	4	ENG 1113		Gr. Th. Lit.	4
PHY 1521		Physics Lab for Eng. I	1	PHY 1522		Physics Lab for Eng II	1				

Second Year

Quarter 4				Quarter 5			
No.		Course	Q.H.	No.		Course	Q.H.
MTH 1227		Calculus IV	4	MTH 1228		Calculus V	4
CIV 1210		Struct. Mech. I	4	ECN 1116		Economics II	4
CIV 1610		Comp. Appl. in CE	4	CIV 1211		Struct. Mech. 2	4
CIV 1510		Materials	4	CIV 1620		Engr. Meas.	4
CIV 1511		Materials Lab	2	CIV 1621		Engr. Meas. Lab.	2

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1225	Math. Anal. I	4	IIS 1366	Eng. Economy	4
	Soc. Sc./Hm. Elctv.	4	ME 1320	Dynamics	4
CIV 1310	Fluid Mech.	4	CIV 1340	Environ. Eng.	4
CIV 1220	Struc. Anal. I	4	SPC 1115	Intro. Comm. Skill	4
CIV 1226	St. An. & Ds. Lab	2			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
CIV 1240	Concrete Des. I*	4	CIV 1410	Soil Mech.	4
	Tech. Elective	4	CIV 1411	Soil Mech. Lab	2
	Soc. Sc./Hm. Elctv.			Tech. Elctv.	
PHY 1224	Physics	4		Soc. Sc./Hum. Elctv.	4
			ECE 1171	Elec. Engr. I	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
CIV 1250	Struct. Des.	4		Gen. Elective†	4
	Tech. Elective	4		Tech. Elective	4
	Tech. Elective	4		Tech. Elective	4
CIV 1640	App. Probability	4		Tech. Elective	4

*In Quarter 8 one-half of the class takes CIV 1240, the other CIV 1410 and CIV 1411; In Quarter 9 the sections are reversed.

†This may be a technical or arts and sciences elective or any other course given at the University. The general elective may be interchanged with an arts and sciences elective in another quarter, with the approval of the Civil Engineering Department.

Technical Electives

Quarters 8 & 10 Fall/Winter			Quarters 9 & 11 Spring		
No.	Course	Q.H.	No.	Course	Q.H.
CIV 1820	Special Topics	4	CIV 1820	Special Topics	4
CIV 1810	Special Topics	4	CIV 1810	Special Topics	4
CIV 1320	Hydraulic Eng.*	4	CIV 1630	C.E. Engr. Sys.	4
CIV 1212	Str. Mch. III†	4	CIV 1550	Constr. Engr.	4
CIV 1241	Ccr. Des. II†	4	CIV 1540	Highway Engr.	4
CIV 1430	Geotechnology	4	CIV 1251	Struct. Des. II†	4
CIV 1341	Environ. Eng. II*	4	CIV 1420	Found. Engr. †	4
CIV 1222	Struct. Analysis	4	CIV 1360	Environ. Des.*	4
CIV 1350	Envl.& Hyd. Lab	4	CIV 1650	Legal Aspects	4
CIV 1650	Legal Aspects	4	CIV 1530	Transp. Engr.	4
			CIV 1224	Struct. Anal. III†	4
			CIV 1370	Air Pollution*	4

*The elective courses completed must have a combined total of at least eleven engineering science credits according to the department's list of elective courses.

Note: During the summer the Civil Engineering Department offers a limited number of technical electives. Students should check with the Department for specific information. Technical electives from other engineering departments may be elected with the approval of the Civil Engineering Department Curriculum Committee.

Specimen Program in Computer Engineering

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1123	Calculus 1	4	MTH 1124	Calculus 2	4	MTH 1128	Calculus 3	4
PHY 1221	Physics 1	4	PHY 1222	Physics 2	4	PHY 1223	Physics 3	4
GE 1100	Fortran	4	GE 1110	Eng'g Graph.	4	CHM 1132	Chem. 2	4
ENG 1111	Fresh. Eng. II	4	PHY 1522	Chem. 1	4	ENG 1113	Gr. Th. Lit.	4
PHY 1521	Physics Lab for Eng I	1	PHY 1522	Physics Lab for Eng II	1			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1225	Math Analysis 1	4	MTH 1227	Calculus	4
PHY 1224	Physics 4	4	ME 1321	Mechanics	4
ECE 1215	Circuits & Systems 1	4	ECE 1216	Circuits & Systems 2	4
	Soc. Sc./Hm. Elctv.	4		Soc. Sc./Hm. Elctv.	4
ECE 1101	E.E. Lab. 1-A	1	ECE 1102	E.E. Lab 1-B	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1217	Circuits & Systems 3	4	ECE 1218	Circuits & Systems	4
ECE 1332	Discrete Systems	4	ECE 1333	Control Systems	4
ECE 1346	Electronics 1	4	ECE 1347	Electronics 2	4
ECE 1301	E.E. Lab 2-A	1	ECE 1302	E.E. Lab 2-B	1
ME 1340	Thermodynamics or	4		Soc. Sc./Hm. Elctv.	4
ME 1386	Material Science	4			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1349	Electron Des. 1	4	ECE 1350	Electron. Des. 2	4
ECE 1363	E.M. Fld. Thry. 1	4	ECE 1364	E.M. Field Theory 2	4
ECE 1381	Comp. Eng'g. 1	4	ECE 1382	Comp. Eng'g. 2	4
	Soc. Sc./Hm. Elctv.	4		Soc. Sc./Hm. Elctv.	4
ECE 1304	E.E. Lab 3-A	1	ECE 1305	E.E. Lab. 3-B	1

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1383	Comp. Eng'g. 3	4	ECE 1408	Physical Elect.	4
ECE 1454	Comm. Systems	4	ECE 1385	Comp. Eng'g. 5	4
ECE 1384	Comp. Eng'g. 4	4	ECE 1386	Comp. Eng'g. 6	4
	Soc. Sc./Hm. Elctv.	4			
ECE 1307	Design Lab	2			

Quarters 4, 6, 8, and 10 offered Fall and Winter.
Quarters 5, 7, and 9 offered Spring and Summer.

Specimen Program in Electrical Engineering**First Year**

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
GE 1100	Comp. for Engr.	4	GE 1110	Engr. Graph. and Des.	4	MTH 1128	Cal.	4
MTH 1123	Calculus I	4	PHY 1222	Physics II	4	PHY 1223	Physics II	4
PHY 1221	Physics I	4	MTH 1124	Calculus II	4	CHM 1132	Gen. Chem.	4
ENG 1111	Fresh. Eng. II	4	CHM 1131	Gen. Chem.	4	ENG 1113	Gr. Th. Lit.	4
PHY 1521	Physics Lab for Eng. I	1	PHY 1522	Physics Lab for Eng. II	1			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1225	Math Anal. 1	4	MTH 1227	Calculus	4
PHY 1224	Physics	4	ME 1321	Mech.	4
ECE 1215	Circ. & Sys. I	4	ECE 1216	Circ. & Sys. 2	4
	Soc. Sci./Hum. Elec.	4		Soc. Sci./Hum. Elec.	4
PHY 1521	Physics Lab	1	PHY 1522	Physics Lab	1
ECE 1101	Elec. Engr. Lab. 1-A	1	ECE 1102	Elec. Engr. Lab 1-B	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1217	Cir. & Sys. 3	4	ECE 1218	Cir. & Sys.	4
ECE 1332	Discrete Syst.	4	ECE 1333	Cont. Sys.	4
ECE 1346	Electron. I	4	ECE 1347	Electron. II	4
ECE 1340	Therm. I or	4	ECE 1302	E.E. Lab 2-B	1
ME 1386	Mat. Sci.	4		Soc. Sci./Hum.	4
ECE 1301	Elec. Engr. Lab II-A	1		Elective	

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1349	Electron Des. 1	4	ECE 1350	Electron. Des. 2	4
ECE 1363	E.M. Field Th. 1	4	ECE 1364	E.M. Field Th. 2	4
ECE 1381	Comp. Eng. 1	4	ECE 1382	Comp. Eng. 2	4
	Soc. Sci./Hum. Elec.	4		Soc. Sci./Hum. Elec.	4
ECE 1304	Elec.Engr. Lab III-A	1	ECE 1305	Elec. Engr. Lab. III-B	1

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1383	Comp. Eng. 3	4	ECE 1420	Control Systems or	4
ECE 1454	Comm. Syst.	4	ECE 1408	Physical Elect. or	4
	Soc. Sci./Hum. Elec.	4	ECE 1465	Wave Tr. & Recep. or	4
	Tech. Elec.	4	ECE 1375	Electromech. Dy.	4
ECE 1307	Elec. Engr. Lab IV	2		Tech. Elective	4
				Tech. Elective	4

Specimen Program in Power Systems

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1123	Calculus I	4	MTH 1124	Calculus II	4	MTH 1128	Calc. III	4
PHY 1221	Physics I	4	PHY 1222	Physics II	4	PHY 1223	Physics III	4
GE 1100	Comp. for Engr.	4	GE 1110	Eng. Graph. and Des.	4	CHM 1132	Gen. Chem.	4
ENG 1111	Fresh. Eng. II	4	CHM 1131	Gen. Chem. I	4	ENG 1113	Gr. Th. Lit.	4
PHY 1521	Physics Lab for Eng. I	1	PHY 1522	Physics Lab for Eng. II	1			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1225	Math. Anal. 1	4	MTH 1227	Calculus	4
PHY 1224	Physics IV	4	ME 1321	Mech.	4
ECE 1215	Cir. & Systems I	4	ECE 1216	Cir. & Systems 2	4
	Soc. Sc./Hm. Elctv.	4		Soc. Sc./Hm. Elctv.	4
ECE 1101	E.E. Lab 1-A	1	ECE 1102	Elec. Engr. Lab 1-B	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1217	Cir. & Sys. 3	4	ECE 1218	Cir. & Sys. 4	4
ME 1340	Therm. I or	4	ECE 1333	Cont. Sys.	4
ME 1386	Mat. Sci.	4	ECE 1347	Electron. 2	4
ECE 1332	Discrete Sys.	4		Soc. Sc./Hm. Elctv.	4
ECE 1346	Electron. 1	4	ECE 1302	E. E. Lab II-B	1
ECE 1301	E.E. Lab II-A	1			

Quarters 4 and 6 offered Fall and Winter.
Quarters 5 and 7 offered Spring and Summer.

Fourth Year

Quarter 8 (Fall Only)			Quarter 9 (Spring Only)		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1349	Electron. Des. 1	4	ECE 1350	Electron. Des. 2	4
ECE 1363	E.M. Field Th. 1	4	ECE 1364	E.M. Field Th. 2	4
ECE 1381	Comp. Eng. 1	4	ECE 1305	Comp. Eng. 2	4
	SS/H	4		SS/H	4
ECE 1304	E.E. Lab III-A			Soc. Sc./Hm. Elctv	4

Fifth Year

Quarter 10 (Winter Only)			Quarter 11 (Spring Only)		
No.	Course	Q.H.	No.	Course	Q.H.
ECE 1471	Elec. Pow. Sys. 1	4	ECE 1472	Elect. Pow. Sys. 2	4
ECE 1371	Elect. Mach. 1	4	ECE 1372	Elect. Mach. 2	4
ME 1341	Thermo. 2	4	ECE 1379	Trans. E. Pow. Sys.	4
ECE 1431	Elec. Pow. Lab 1	1	ECE 1434	Elect. Pow. Lab 2	2
	Soc. Sc./Hm. Elctv.	4			

*In Quarter 11, only one technical elective is required for graduation.

Specimen Program in General Engineering**First Year**

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1123	Calculus	4	MTH 1124	Calculus	4	MTH 1125	Calculus	4
PHY 1221	Physics I	4	PHY 1222	Physics II	4	PHY 1223	Physics III	4
GE 1100	Comp. for Engr.	4	GE 1110	Engr. Graph. & Des.	4	ENG 1113	Gr. Th. Lit.	4
ENG 1111	Fresh. Eng. II	4		Soc. Sc./Hm. Elctv.	4		Soc. Sc./Hm. Elctv.	4
PHY 1521	Physics Lab for Eng. I	1	PHY 1522	Physics Lab for Eng II	1			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1227	Calculus	4	MTH 1228	Calculus	4
PHY 1224	Physics IV	4		Engr. Sci. Elctv.	4
	Engr. Sci. Elctv.	4		Coord. Study Elctv.	4
	Soc. Sc./Hm. Elctv.	4		Soc. Sc./Hm. Elctv.	4
PHY 1521	Physics Lab I	1	PHY 1522	Physics Lab II	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
	Engr. Sci. Elctv.	4		Engr. Sci. Elctv.	4
	Coord. Study Elctv.	4		Engr. Sci. Elctv.	4
	Coord. Study Elctv.	4		Coord. Study Elctv.	4
	Soc. Sc./Hm. Elctv.	4		Soc. Sc./Hm. Elctv.	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
	Engr. Sci. Elctv.	4		Engr. Sci. Elctv.	4
	Engr. Sci. Elctv.	4		Engr. Sci. Elctv.	4
	Coord. Study Elctv.*	4		Coord. Study Elctv.	4
	Coord. Study Elctv.	4		Coord. Study Elctv.	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
	Engr. Sci. Electv	4		Engr. Sci. Electv	4
	Engr. Sci. Electv	4		Coord. Study Electv	4
	Coord. Study Electv	4		Coord. Study Electv	4
	Coord. Study Electv	4		Coord. Study Electv	4

Note: Quarters 4, 6, 8, and 10 offered Fall and Winter; quarters 5, 7, and 9 offered Spring and Summer.
*Coordinated Study electives are courses chosen to meet the student's career objectives; these courses will be selected in conjunction with the student's adviser and are subject to the adviser's approval.

Specimen Program in Industrial Engineering

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1123	Calculus I	4	MTH 1124	Calculus II	4	MTH 1128	Calculus III	4
PHY 1221	Physics I	4	PHY 1222	Physics II	4	PHY 1223	Physics III	4
GE 1100	Comp. for Engr.	4	GE 1110	Engr. Graph. and Des.	4	CHM 1132	Gen. Chem.	4
ENG 1111	Fresh. Eng. II	4	CHM 1131	Gen. Chem.	4	ENG 1113	Gr. Th. Lit.	4
PHY 1521	Physics Lab. for Eng I	1	PHY 1522	Physics Lab for Eng II	1			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
IIS 1200	Work Des.	4	IIS 1300	Probabilistic	4
MTH 1227	Calculus IV	4	ME 1311	Statics	4
PHY 1224	Physics IV	4	MTH 1228	Calculus V	4
ECN 1115	Economics I	4	ECN 1116	Economics II	4
PHY 1521	Physics Lab I	1	PHY 1522	Physics Lab II	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
IIS 1330	Prin. of Comp. and Prog. I	4	IIS 1320	Statistics II	4
ECE 1171	Elec. Engr. I	4	IIS 1340	Operations Res. I	4
	Math Elective	4		Engr. Sci. Elect.	4
IIS 1310	Statistics I	4		Technical Elective	4
MTH 1225	Math Analysis	4			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
IIS 1400	Systems I	4	IIS 1360	Engr. Econ. and	
IIS 1350	Dig. Sim. Tech.	4		Dec. Thry.	4
IIS 1341	Operations Res. II	4		Engr. Sci. Elect.	4
	Behavioral Sci.	4		Behavioral Sci.	4
				Elective	4
	Elective	4	IIS 1405	Prod. Inv. Cl.	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
IIS 1480	People in Orgns.	4		Tech Elective	4
IIS 1401	Design Project	4		Tech Elective	4
	Tech Elective	4		Open Elective	4
	Soc. Sci./Hum.	4		Soc. Sci./Hum.	4
	Elective			Elective	

The elective courses completed must have a combined total of at least twelve engineering science credits and two design credits.

Specimen Program in Mechanical Engineering

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
GE 1100	Comp. for Engr.*	4	GE 1110	Engr. Graph. and Des.*	4	MTH 1125	Calculus III	4
MTH 1123	Calculus I	4	MTH 1124	Calculus II	4	PHY 1223	Physics III	4
PHY 1221	Physics I	4	PHY 1222	Physics II	4	ENG 1113	Gr. Th. Lit.*	4
ENG 1111	Fresh. Engl. II*	4	CHM 1131	Gen. Chem.*	4	CHM 1131	Gen. Chem.*	4
PHY 1521	Physics Lab for Eng. I	1	PHY 1522	Physics Lab for Eng II	1			

*First-year pattern of two-term courses may vary according to assigned section.

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
ME 1311	Statics	4	ME 1312	Dynamics I	4
MTH 1227	Calculus IV	4	ME 1341	Therm. II	4
ME 1340	Thermodynamics I	4	MTH 1228	Calculus V	4
PHY 1521	Physics Lab. I	1	PHY 1522	Physics Lab II	1
ECN 1115	Prin. and Prob. of Econ. or	4	ECN 1115	Prin. and Prob. of Econ. or	4
ME 1390	Meas. and Analysis	4	ME 1390	Meas. and Analysis	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1225	Math. Anal. I	4	ME 1380	Materials Sci. or	5
ME 1313	Strgthmat I	4	ECE 1171	Elect. Eng.	4
ME 1315	Dynamics II	4	ME 1226	Math. Analysis II	4
ME 1370	Fluid Mechanics	4	ME 1314	Strgthmat II	4
ENG 1340	Writing Labs	1	ME 1345	Heat Transfer	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
	Tech. Elective	4		Soc. Sci./Hum. Elec.	4
	Soc. Sci./Hum. Elec.	4	ME 1405	Mech. Vibrations	4
ME 1330	Mechanical Design or	4	ME 1330	Mechanical Design or	4
ME 1332	Thermal Design	4	ME 1332	Thermal Design	4
ECE 1171	Elect. Eng. or	4		Physics/Sci. Elec.	4
ME 1380	Materials Science	4			

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
	Tech. Elective	4		Tech. Elective	4
ME 1331	Design Project	4		Tech. Elective	4
	Soc. Sci./Hum. Elec.	4		Soc. Sci./Hum. Elec.	4
	Design Elect.		ME	Design Elec.	5

Technical electives must be 4 or 5 Q.H. courses and include one Materials Elective.
One of the 5 Q.H. Design Electives may be an Independent Design Project.
Seniors with a QPA 3.25 or above are, on a space-available basis, encouraged to elect graduate courses in lieu of technical electives.

Specimen B.S./M.S. Program in Mechanical Engineering

During the first two years of study, students enrolled in the B.S./M.E. Program in Mechanical Engineering pursue a curriculum similar to that of the regular M.E. Program.

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
ME 1341	Therm. II	4	ME 1370	Fluid Mech.	4
ME 1313	Strength I	4	ME 1380	Mats. Science or	4
ME 1390	Meas. and Anal. or	4	ME 1390	Meas. and Anal.	4
ME 1380	Mat. Science	5	ME 1314	Strength II	4
MTH 1225	Math Analysis	4	MTH 1226	Math Analysis	4
	Soc. Sci./Hum. Elective	4		Soc. Sci./Hum. Elective	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
ME 1330	Mechanical Des.	4	ME 1345	Heat Transfer I	4
ECE 1171	Electrical Eng.	4	ME 1315	Dynamics	4
	Tech. Elective	4		Tech. Elective	4
	Soc. Sci./Hum. Elective	4		Soc. Sci./Hum. Elective	4
ME 3100	Math Methods I	4		Grad. Elective	4

Fifth Year

Quarter 10			Quarter 11			Quarter 12		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
	Grad. Elective	10		Grad. Elective	10		Thesis	6
	B.S. Tech. Elective	4		B.S. Tech. Elective	4		B.S. Tech. Elective	8
ME 1332	Thermal Design	4	ME 1331	B.S. Design Proj.	4		Grad. Elective	4
	Grad. Seminar	2						

A 3.0 or better QPA is required for admission to the program after the freshman year. Freshmen are eligible for entry only through the Admissions Department prior to enrolling at Northeastern. All students must maintain a 3.0 or better QPA to stay in the program.

A complete program must be arranged with, and approved by, a faculty adviser no later than the end of the third year. The program will vary for each student and the above is only a sample arrangement.

Consult the *Mechanical Engineering Undergraduate Curriculum Guide* for information regarding choice of B.S. electives.

Graduate courses are selected according to the graduate degree requirements listed in the *Graduate School of Engineering Student Guide* and *Catalog*.

School of Engineering Technology

Specimen Program in Aerospace Maintenance

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1194	Calculus II	4	ENG 1111	Fresh. Eng. II	4	MTH 1195	Calculus III	4
GET 1170	Graphics I	4	PHY 1192	Physics II	4	PHY 1193	Physics III	4
PHY 1191	Physics I	4	PHY 1194	Physics Lab I	2	PHY 1195	Physics Lab II	2
ENG 1110	Fresh. Eng. I	4	GET 1100	Cp. Pg. for Eng. Tch.	4	GET 1170	Graphics II	4
				Soc. Sc./Hm. Elctv.	4	ENG 1114	Fresh. Tech. Writ.	4

Second Year

Quarter 4				Quarter 5		
No.	Course		Q.H.	No.	Course	Q.H.
MET 1301	Mechanics A		4	MET 1302	Mechanics B	4
EET 1320	Elec. & Elec. I		4	MET 1314	Strss. Anal. A	4
MET 1340	Thermo. A.		4	MET 1380	Materials A	4
ECN 1115	Econ. Prin.		4		SS/HST Elective	4

Third Year

Quarter 6				Quarter 7		
No.	Course		Q.H.	No.	Course	Q.H.
MET 1481	Materials B		4	MET 1370	Fluid Mech. A	4
MET 1390	Meas. & Ana. Lab		4	MET 1391	Tech. Lab A	2
MET 1315	Strss. Anal. B		4	MET 1393	Tech. Lab C	2
	Tech. Elective		4		Tech. Elective	4
	SS/HST Elective		4		SS/HST Elective	4

Specimen Program in Electrical Engineering Technology**First Year**

Quarter 1				Quarter 2			Quarter 3		
No.		Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1191		College Algebra	4	MTH 1192	Pre-Calculus	4	MTH 1193	Calculus I	4
PHY 1191		Physics I	4	PHY 1192	Physics II	4	PHY 1193	Physics III	4
ENG 1110		Fresh. Eng. I	4	ENG 1111	Fresh. Eng. II	4	ENG 1114	Fresh. Tech. Writ.	4
GET 1170		Eng. Graphics I	4	GET 1110	Computer Program.	4	GET 1171	Eng. Graph. II	4
				PHY 1194	Physics Lab. I	2	PHY 1195	Physics Lab. II	2

Second Year

Quarter 4				Quarter 5		
No.	Course		Q.H.	No.	Course	Q.H.
MTH 1194	Calculus 2		4	MTH 1195	Calculus 3	4
EET 1151	Circ. Analys. I		4	EET 1152	Circ. Analys. II	4
ECN 1115	Prncpls. Econmcs.		4	MET 1319	Mechanics	4
	Soc. Sc./Hm. Elctv.		4		Soc. Sc./Hm. Elctv.	4
				EET 1124	Circuit Lab. I	2

Third Year

Quarter 6				Quarter 7		
No.	Course		Q.H.	No.	Course	Q.H.
EET 1353	Circ. Analys. III		4	EET 1354	Circ. Analys. IV	4
EET 1311	Electronics I		4	EET 1312	Electronics II	4
EET 1360	Engineer. Analys.		4	EET 1310	Electrical Measure.	4
EET 1125	Circuit Lab. II		2	EET 1323	Electrical Lab.	2
SPC	Spch./Com. Elctv.		4		Open Elctv.*	

Fourth Year

Quarter 8				Quarter 9		
No.	Course		Q.H.	No.	Course	Q.H.
EET 1313	Electronics III		4	EET 1314	Pulse & Digital I	4
	Tech. Elective		4		Technical Elective	4
	Soc. Sc./Hm. Elctv.		4		Soc. Sc./Hm. Elctv.	4
EET 1330	Energy Conversion		4	EET 1337	Distributed Systems	4
EET 1327	Advnc. El. Lab. I		2	EET 1328	Advcd. Elec. Lab. II	2

Fifth Year

Quarter 10				Quarter 11		
No.	Course		Q.H.	No.	Course	Q.H.
EET 1377	Control Engrn. I		4	EET 1378	Control Engineer. II	4
EET 1370	Digital Cmptrs. I		4	EET 1371	Digital Computers II	4
	Tech. Elective		4		Technical Elective	4
EET 1329	Adv. El. Lab. III		2		Soc. Sc./Hm. Elctv.	4

*No Phys. Ed., ROTC, Introductory.

Technical Elective Sequences

(A) Power Systems Sequence (B) Communications Engineering Sequence

No.	Course	Q.H.	No.	Course	Q.H.
EET 1362	Bas. Pwr. Sys. I	4	EET 1317	Prin. of Com. Sys. I	4
EET 1363	Bas. Pwr. Sys. II	4	EET 1318	Prin. of Com. Sys. II	4
EET 1364	Bas. Pwr. Sys. III	4	EET 1319	Prin. of Com. Sys. III	4
	Tech. Elective	4		Tech. Elective	4

Specimen Program In Mechanical Engineering Technology

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1191	Alg. & Trig. I	4	MTH 1192	Alg. & Trig. II	4	MTH 1193	Calculus I	4
PHY 1191	Physics I	4	PHY 1192	Physics II	4	PHY 1193	Physics III	4
ENG 1110	Fresh. Eng. I	4	PHY 1194	Physics Lab. I	2	ENG 1114	Fresh. Tech. Writ.	4
GET 1170	Eng. Grphcs. 1 or	4	ENG 1111	Fresh. Eng. II	4	GET 1171	Graphics 2	4
GET 1100	Computer 1		GET 1110	Computer 1 or	4	PHY 1195	Physics Lab. II	2
			GET 1170	Eng. Graphics I	4			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1194	Calculus A	4	MTH 1195	Calculus B	4
GET 1364	Kinematics	4	MET 1302	Mechanics B	4
MET 1301	Mechanics A	4	MET 1314	Stress Analysis A	4
EET 1320	Electr./Electron.	4	CHM —	Chemistry	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
MET 1315	Stress Analysis B	4	MET 1380	Materials A	4
MET 1390	Meas. Lab.	2	MET 1391	Tech. Lab. A	2
MET 1340	Thermo A.	4	MET 1341	Thermo B	4
MET 1303	Mechanics C	4	MET 1370	Fluids A	4
ECN 1115	Economics	4		Soc. Sc./Hm. Elctv.	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
MET 1330	Mech. Des. A	4	MET 1331	Mech. Des. B	4
MET 1392	Tech. Lab. B	2	MET 1393	Tech. Lab. C	2
MET 1371	Fluids B	4	MET 1342	Ref. & Air Cond.	4
MET 1396	Machine Shop or	4		Soc. Sc./Hm. Elctv.	4
IIS —	Elective or	4		Technical Elective	4
SPC —	Communctn. Electv.	4			

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
MET 1394	Tech. Lab. D	2	MET 1395	Tech. Lab. E	2
MET 1356	Eng. Econ.	4	MET 1343	Heat Transfer	4
	Soc. Sc./Hm. Elctv.	4		Open Elective*	4
	Technical Elec.	4		Soc. Sc./Hm. Elctv.	4
MET 1481	Materials B or	4			
MET 1416	Stress Analysis C	4			
Techn. electives must be chosen from:			No.	Course	Q.H.
MET 1416	Stress Analysis C	4	MTH 1196	Differential Equats.	4
MET 1415	Exp. Stress Analysis	4	EET 1321	Electricity and Electronics	4
MET 1414	Mech. Vibrations	4	EET 1390	Optical instrumen-tation	4
MET 1481	Materials B	4			
MET 1444	Power Gen.	4	CHT 1381	Nuclear Technology	4

*No Phys. Ed, ROTC, Remedial.

Specimen Program in Computer Technology

First Year

Quarter 1				Quarter 2			Quarter 3		
No.	Course	Q.H.		No.	Course	Q.H.	No.	Course	Q.H.
MTH 1191	College Algebra	4		MTH 1192	Pre-Calculus	4	MTH 1193	Calculus I	4
PHY 1191	Physics I	4		PHY 1192	Physics II	4	PHY 1193	Physics III	4
ENG 1110	Fresh. Eng. I	4		ENG 1111	Fresh. Eng. II	4	ENG 1114	Fresh. Tech. Writ.	4
GET 1170	Eng. Graphics I	4		CT 1105	Intro. to Prog.	4	CT 1341	Basic Comp. Organ.	4
				PHY 1194	Physics Lab. I	2	PHY 1195	Physics Lab II	2

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
MTH 1194	Calculus II	4	MTH 1195	Calculus III	4
EET 1151	Circuits. Analys. I	4	EET 1152	Circuits Analysis II	4
ECN 1115	Economics I	4		SS/HUM	4
CT 1310	Fortran	4	CT 1311	"C" Language	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
EET 1311	Electronics I	4	CT 1330	Non-Num. Algo.	4
CT 1340	Mod. Prog. Tech.	4	CT 1374	Intro. to CPU Hdwre.	4
	SS/HUM	4	CT 1342	Adv. Comp. Organ.	4
CT 1345	Assembly Lang.	4	CT 1368	Semicond. Logic	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
CT 1375	CPU Hdwre. Arch.	4	CT 1355	Micro-Peri. Hdwre.	4
CT 1335	Num. Algo.	4	CT 1380	Data Comm. Methods	4
CT	Comp. Tech. Elec.	4	CT	Comp. Tech. Elective	4
CT 1369	Comp. Logic	4		Tech Elective	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
CT 1356	Cmplx. Per. Hdw.	4		Technical Elec.	4
CT 1360	Industry Software	4	CT 1365	Industry Hardware	4
	Arts & Sci. Elec.	4		Arts & Science Elect.	4
CT	Comp. Tech. Elec.	4	CT 1342	Adv. Comp. Organ.	4

College of Nursing

Specimen Program for Baccalaureate Degree in Nursing

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
BIO 1140	Bas. Ani. Bio I	4	CHM 1111	Gen. Chem.	5	CHM 1112	Gen. Chem.	5
	History Elective	4	BIO 1141	Bas. Ani. Bio. II	4	BIO 1255	Hum. Anatomy	4
ENG 1100	Fresh. Eng. I	4	ENG 1111	Fresh. Eng. II	4		Elective	4
NUR 1100	Nursing	4	NUR 1101	Nursing	4	NUR 1102	Nursing	4

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
BIO 1120	Bas. Microbiol.	4	BIO 1254	Hum. Physiol. II	4
PSY 1111	Fnd. Psych.	4	PSY 1112	Fnd. Psych. I	4
NUR 1200	Nursing	6	SOA 1100	Soc. Anthro.	4
BIO 1253	Hum. Physiol. I	4	NUR 1201	Nursing	6

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
Section I			Section I		
PSY 1241	G and D I	4	PSY 1241	G and D I	4
PSY 1271	Soc. Psych.	4	SOC 1100	Sociology	4
NUR 1301	Psych. Nursing	7	PCL 1305	Pharmac.	3
			NUR 1300	Nursing	7
No.	Course	Q.H.	No.	Course	Q.H.
Section I			Section II		
PSY 1242	G and D II	4	PSY 1242	G and D II	4
PCL 1305	Pharmacol.	3	NUR 1301	Nursing	7
SOC 1100	Sociology	4	PSY 1271	Soc. Psych.	4
NUR 1300	Nursing	7			
NUR 1302	Nurs. Trans. (R.N. only)	9			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
NUR 1400	Mat. Child Nur.*	9	NUR 1401	Med. Surg. Nursing*	9
	Hum. Elective	4		Hum. Elective	4
	Gen. Elective	4		Gen. Elective	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
NUR 1500	Com. Hlth. Nur.	9	NUR 1501	Contemp. Nur.	5
	Elective	4		Elective	(4)
	Elective	4		(if desired)	
			NUR 1502	Intro. Nur. Res.	4

*Each of these courses is offered in Quarters 8 and 9, but only one is to be taken per quarter.

177 Q.H. = Minimum graduation requirement.

Degrees

The College of Nursing offers a five-year program leading to the Bachelor of Science in Nursing. The program is open to registered nurses in both day and evening sections. Students eligible for advanced placement may complete the program in less than five years.

Quantitative Requirements

Candidates for the Bachelor of Science degree must successfully complete all of the prescribed courses in the applicable curriculum. For the Bachelor of Science degree this totals 177 quarter hours. The prescribed periods of cooperative work at health agencies associated with the University are not required of the registered nurses.

College of Pharmacy and Allied Health Professions

Specimen Program in Pharmacy (Five-Year Cooperative)

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
	Electives	8	BIO 1106	Gen. Bio.	4	CHM 1122	Gen. Chem.†	5
MTH 1106	Fund. Math.* or	4	MTH 1107	Func. & Bas. Cal.* or 4		BIO 1107	Ani. Bio.	4
MTH 1107	Func. & Bas. Cal.*	4	MTH 1108	Calculus*	4	ENG 1111	Fresh. Eng. II	4
CHM 1111	Gen. Chem.	5	ENG 1110	Fresh. Eng. I	4		Elective	4
			PAH 1135	Prof. Dynamics in Hlth. Care Deliv. Sys.	4			

*Minimum math requirement: MTH 1108.
†CHM 1151, CHM 1152, General Chemistry, may be taken in place of CHM 1122, but one year of high school calculus is recommended.

Second Year

Quarter 4 (Entire Class) (Sept.-Dec.)			Quarter 4A (Entire Class) (Jan.-March)			Quarter 5 (April-June & June-Sept.)		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
PHY 1201	Physics I	4	PHY 1203	Physics III	4	PAH 1204	Anat. & Phys. II	5
CHM 1264	Organic Chem.	5	CHM 1265	Organic Chem.	5	PAH 1280	Bio. Chem.	5
	A. & S. Elective	4	PCT 1230	Basic Pharm. or	3		A. & S. Elective	4
PCT 1230	Basic Pharm. or	3		A. & S. Elective	4	PHP 1303	Intrnshp. Skills for Hlth. Prof.	4
	Elective	4	PAH 1202	Anat. & Physiology I	5			

Third Year (Transition Year)

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
PCT 1340	Pharmaceutics	4	PCT 1350	Pharmaceutics	5
PMC 1418	Med. Chm./Pharm. I	4	PCL 1450	Pharmacol. Lab I	1
PCL 1410	Pathology	4	PCT 1320	Pharmaceu. Lab II	2
PMC 1321	Phrm. Anl. & Q.C.	4	PCL 1420	Pharm. Med./Chem. II	6
PCT 1310	Pharmaceu. Lab.	1	PHP 1304	Social Psychology	4

Fourth Year (Transition Year)

Quarter 8			Quarter 9 (Entire Class) (April-June)		
No.	Course	Q.H.	No.	Course	Q.H.
PCL 1422	Phm. Med./Chm. III	6	TOX 1300	Toxicology	4
PCT 1440	Bioph./P'kin.	4	PHP 1601	Non-Presc. Med.	4
PCL 1452	Phrmclgy. Lab II	1	PHP 1602	Clin. Phrm. Thrputs.	5
PMC 1321	Phrm. Anl. & Q.C.	4	PCT 1441	Phrmcoknetc. Prin. in Drug Therapy	4
PCT 1310	Pharmaceu. Lab	1			

Fifth Year

Quarter 10 (Summer)			Quarter 11 (Fall)		
No.	Course	Q.H.	No.	Course	Q.H.
PHP 1502	Clin. Pharm. Clerkship or	15	PHP 1502	Clin. Pharm. Clerkship or	15
PHP 1501	Phrm. Extrnshp. or	4	PHP 1501	Phrm. Extrnshp. or	4
PHP 1402	Paraphrmceuticals	2	PHP 1306	Com. Phrm. Mgt. or	4
PHP 1503	Prof. Prctce. Lab	1	PHP 1305	Hosp. Phrm. Mgmt.	4
PHP 1302	Phrm. Admin.	4	PHP 1304	Social Pharmacgy.	4
PHP 1303	Interper. Skills for Hlth. Prfnls	4		Prof. Elective	4
PHP 1401	Drug Info. & Eval.	3			
	Prof. Elective	4			

Quarter 12 (Winter)			Quarter 13 (Spring)		
No.	Course	Q.H.	No.	Course	Q.H.
PHP 1502	Clin. Phrm. Clnkshp. or	15	PHP 1502	Clin. Phrm. Crksh. or	15
PHP 1501	Phrm. Extrnshp. or	4	PHP 1501	Phrm. Extrnshp. or	4
PHP 1402	Paraphrmaceutcls	2	PHP 1301	Phrm. Jrisprdnce.	4
PHP 1503	Prot. Protce. Lab	1	PHP 1306	Comm. Phrm. Mgt. or	4
PHP 1302	Phrm. Admin.	4	PHP 1305	Hosp. Phrm. Mgt.	4
PHP 1303	Interp. Skls. for Hlth. Profsnls.	4	PHP 1304	Social Phrmacgcy.	4
PHP 1401	Drug Inf. & Eval.	3		Prof. Elective	4
	Prof. Elective	4			

NOTES: About one quarter of the class will be in PHP 1502, one quarter in PHP 1501, and one half in the classroom for each quarter. Students must take a total of 8 credits for professional electives. All 8 credits may be taken in one quarter or as outlined above.

English 1340 Writing Workshop—Middler year writing requirement can be filled by taking English 1340 upon completion of 80 Q.H. beginning with the class of 1989.

Specimen Program in Dental Hygiene*

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
CHM 1101	Gen. Chem.	4	CHM 1102	Gen. Chem.	4	BIO 1120	Microbio. Prof. Crs.	4
BIO 1150	Anat. and Phys. Prof. Courses	5	BIO 1151	Prof. Courses Anat. & Phys.	5			

Second Year

Quarter 4			Quarter 5			Quarter 6		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
ENG 1110	Fresh. Eng. I Prof. Courses	4	PSY 1111	Fnd. Psych. I Prof. Courses	4	SOC 1100	Intro Soc.	4
						ENG 1111	Fresh. Eng. II Prof. Courses	4

*Students are admitted directly to the Forsyth School for Dental Hygienists and should contact the School for catalogs, applications, and complete program information by writing to:
Forsyth School for Dental Hygienists
140 The Fenway
Boston, Massachusetts 02115

Specimen Program in Medical Laboratory Science (Five-Year Cooperative)

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1106	Fund. Math. or		MTH 1107	Func. Calculus or		ENG 1111	Fresh. Eng. II	4
MTH 1107	Func. Calculus	4	MTH 1108	Calculus	4	MLS 1111	BS Urinalysis	4
CHM 1111	Gen. Chem. I	5	CHM 1122	Gen. Chem. II	5	CHM 1221	Analyt. Chem.	4
BIO 1106	Gen. Bio.	4	BIO 1107	Anim. Bio.	4		Elective	4
ENG 1110	Fresh. Eng. I	4	PAH 1135	Prof. Dyn.	4		Comp. Sci. Elective	4
MLS 1101	Med. Lab. Orien.	1	MLS 1102	MLS Orient. II	1			

Second Year

Quarter 4
Entire Class

No.	Course	Q.H.
CHM 1264	Org. Chem. I	5
BIO 1253	Humn. Physio. I	4
MLS 1141	Microbiology	6
	Statistics Elec.	4

Quarter 4A
Entire Class

No.	Course	Q.H.
MLS 1121	Hematology I	3
MLS 1122	Hematology II	3
MLS 1131	Immunohem. Serol.	6
CHM 1265	Org. Chem. II	5

*MLT applies for Clinical.

Quarter 5
(*Regular co-op sequence starts in quarter 5.)

No.	Course	Q.H.
MLS 1642	Med. Parasit. or	3
MLS 1643	Med. Mycology	3
BIO 1254	Humn. Physgy. II	4
MLS 1151	BS Cl. Chem.	5
	Elective(s)	4-8

Third Year

Quarter 6

No.	Course	Q.H.
BIO 1260	Genet. & Devel.	4
PHY 1201	Physics I	4
PHY 1501	Physics Lab	1
	Elective(s)	8-12

*M.T. applies for Clinical.

Quarter 7

No.	Course	Q.H.
PHY 1202	Physics II	4
BIO 1261	Cell Phys. Bio.	4
BIO 1221	Gen. Micro.	3
MLS 1643	Med. Mycology or	3
MLS 1642	Med. Parasit.	3
PHY 1502	Physics Lab	1
	Elective	4

Fourth Year

Quarter 8

No.	Course	Q.H.
MLS 1645	Adv. Cl. Micro. I*	2
MLS 1651	Adv. Cl. Chem. I*	2
MLS 1621	Adv. Hem. I*	3
MLS 1646	Adv. Cl. Mc. II**	2
MLS 1652	Ad. CL. Cm. II**	2
MLS 1631	Adv. Imm. Hem.**	2
MLS 1523	Hem. Mt. Apst. and	4
MLS 1532	Immunohem. AS or	3
MLS 1544	Clin. Micro. AS or	7
MLS 1552	Clin. Chem. AS	7
MLS 1890	Undergrad Rsch. (optional)	2

*Fall

**Winter

Quarter 9

No.	Course	Q.H.
MLS 1523	Hematology AS	4
MLS 1532	Immunohem AS or	3
MLS 1544	Clin. Mcr. AS or	7
MLS 1552	Clin. Chem. AS	7
MLS 1622	Hematology II	2
MLS 1647	Adv. Clin. Micro. III	2
MLS 1653	Adv. Clin. Chem. III	2
MLS 1890	Undrgrd. Rsch. (Opt.)	2

Fifth Year

Quarter 10

No.	Course	Q.H.
MLS 1523	Hematology AS and	4
MLS 1532	Immunohem. AS or	3
MLS 1544	Clin. Micro. AS or	7
MLS 1552	Clin. Chem. AS	7
MLS 1646	Clin. Micro. II**	2
MLS 1631	Adv. Immunohmatl.**	2
MLS 1652	Adv. Clin. Chm. II** or	2
MLS 1645	Adv. Clin. Micro.* and	2
MLS 1651	Adv. Clin. Chem.* and	2
MLS 1621	Hematology I*	3

*taken Fall quarter

**taken Winter quarter

Quarter 11

No.	Course	Q.H.
MLS 1681	MLS Sen. Sem.	2
MLS 1665	Med. Lab. Mgmt.	2
MLS 1661	MLS Ed.	2
	Electives	4-12
MLS 1831	Adv. Immuno.	4
MLS 1832	Adv. Immuno. Lab. (optional)	1

Elective Distribution Requirements

12 Q.H. of Humanities

8 Q.H. of Social Sciences; 4 Q.H. Prof. Dynamics

16-28 Q.H. of Free Electives; including one Computer Science and one Statistics course.

MATH Competency to the level of MTH 1107 is required.

English 1340 Writing Workshop—Middle year writing requirement can be filled by taking English 1340 upon completion of 80 Q.H. beginning with the class of 1989.

Specimen Program in Health Record Administration

(Five-Year Cooperative)

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1101	Bas. Math*	4	MTH 1103	Bas. Math.*	4	BIO 1121	Intro. Microbio.	3
BIO 1106	Gen. Bio.	4	BIO 1107	Anim. Bio.	4	PSY 1112	Fnd. Psych. II	4
PSY 1111	Fnd. Psych. I	4	PAH 1135	Dynam. of Hlth. Care	4	ENG 1111	Fresh. Eng. II	4
ENG 1110	Fresh. Eng. I	4		A. & S. Elective	4		A. & S. Elective	4
HRA 1100	Orient. Med. Rec. I	1						

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
SOC 1100	Intro. Socio. or	4	MTH 1150	Prob. Stat. & Comp.	4
SOA 1100	Anthropology		BIO 1151	Hum. Anat. II	5
HRA 1101	Lng. of Hlt. Prf.	1	HRM 1432	OBI	4
	A. & S. Elective	4		A. & S. Elective	4
	Elective	4			
BIO 1150	Hu. Anat. 1	5			

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
HRA 1310	Hosp. Law	2	HRA 1340	Fnd. Med. Sci. II	3
HRA 1320	Lang. of Medicine	4	HRA 1420	Hlth. Rec. Sci. II	4
HRA 1330	Fnd. Med. Sci. I	3	HRA 1610	Int. DP for Hlth. Sci.	4
HRA 1410	Hlth. Rec. Sci. I	4	SPC 1115	Intro. Commun.	4
	Elective	4			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
HRA 1430	Hlth. Rc. Sc. III	4	HRA 1440	Hlth. Rec. Sci. IV	4
HRA 1450	Appl. Hlth. Rec. Dir. Prac. I	3	HRA 1540	Qual. Assur.	4
HRA 1510	Org. & Mngt. Med. Rec. Dp. I	4	HRA 1460	Appl. Hlth. Rec. Dir. Pract. II (7 days)	2
HRA 1620	Sys. Anal.	4	HRA 1520	Mngt. of Hlth. Rec. Service II	4
HRA 1580	Hlth. Record Ed.	2	HRA 1640	Med. Comp. Appl.	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
HRA 1530	Mgmt. of Hlth. Rec. Service III	4	HRA 1560	Sem. Hlth. Rec.	2
HRA 1630	App. Hlth. Stats.	4	HRA 1570	Hlth. Rec. Prof.	2
			HRA 1800	Indep. Study	4
			HRA 1470	Appl. Hlth. Rec. Sci III	4
				Elective	4

*Students may substitute MATH 1106 (4 Q.H.) and 4 Q.H. Elective for MTH 1101 and MTH 1103.

HRA 1810 Special Topics 1, 2 QH

HRA 1820 Special Topics 2, 2 QH

Assigned by Program Director

English 1340 Writing Workshop—Middler year writing requirement can be filled by taking English 1340 upon completion of 80 Q.H. beginning with the class of 1989.

Specimen Program in Respiratory Therapy B.S. (Five-Year Cooperative)

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1106	Fund. Math.	4	MTH 1107	Func. and Bas. Calc.	4	ENG 1111	Fresh. Eng. II	4
CHM 1111	Gen. Chem.	5	BIO 1141	Bas. Ani. Bio. II	4	BIO 1120	Microbio.	4
BIO 1140	Bas. Ani. Bio.	4	PHY 1209	Basic Physics	4	CHM 1122	Gen. Chem.	5
ENG 1110	Fresh. Eng. I	4	RTH 1112	Resp. Ther. Sem. II	1	RTH 1113	Resp. Ther. Sem. III	1
RTH 1111	Resp. Ther. Sem. I	1	PAH 1135	Prof. Dynmics. in the Hlth. Care Deliv. Sys.	4		A. & S. Elective	4

Second Year

Quarter 4			Quarter 4A			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
PAH 1202	Anat. Physiol. I	5	PCL 1309	Phrmcl./Resp. Care	4	RTH 1403	Prof. Prac. Lab III	1
RTH 1301	Prof. Prac. Lab I	1	PAH 1204	Anat. Physiol. II	5	RTH 1414	Clin. Sem. I	1
RTH 1320	Cardio. Pul. Phys.	4	RTH 1302	Prof. Prac. Lab II	1	RTH 1433	Resp. Care/Md. Srg.	4
RTH 1331	Patient Care	4	RTH 1332	Intro. Resp. Care	4	RTH 1411	Clin. Prac.	6
	A. & S. Elective	4	RTH 1321	Cardio.-Pul. Dis.	4		A. & S. Elective	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
RTH 1404	Prf. Prac. Lab IV	1	RTH 1505	Cardio.-Pul. Lab.	1
RTH 1412	Clin. Prac. II	6		Prac.	
RTH 1415	Clin. Sem. II	1	RTH 1435	Pediatrics	2
RTH 1434	Resp. Care/Crit. Patient	4		A. & S. Elective	4
PCL 1410	Pathology	4	RTH 1573	Card.-Pul. Lab Tnqs.	4
			PHL 1165	Prob. in Med.	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
CHM 1264	Organic Chem I	5	CHM 1265	Organic Chem. II	5
RTH 1516	Adv. Resp. Thrpy. Sem. I	1	RTH 1517	Adv. Clin. Sem. II	1
RTH 1571	Adv. Life Sup. Sys. I	4	RTH 1574	Prof. Elective	4
RTH 1578	Adv. Med. Monit. A. & S. Elective	4		Adv. Clin. Physiology	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
RTH 1518	Adv. Clin. Sm. III	1	RTH 1519	Adv. Clin. Sem. IV	1
RTH 1576	Neonatology	4	RTH 1512	Practicum	4
RTH 1801	Dir. Study	2		A. & S. Electives	4
RTH 1511	Practicum	4	RTH 1802	Dir. Study	2
	A. & S. Elective	4		Prof. Elective	4

English 1340 Writing Workshop—Middler year writing requirement can be filled by taking English 1340 upon completion of 80 Q.H. beginning with the class of 1989.

Specimen Program in Toxicology

(Five-Year Cooperative)

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1106	Math	4	MTH 1107	Math	4	MTH 1108	Calculus	4
	Elective	4	CHM 1111	Gen. Chem.	5	ENG 1111	Fresh. Eng. II	4
BIO 1106	Gen. Bio. I	4	BIO 1107	Anim. Bio.	4		Elective	4
ENG 1110	Fresh. Eng. I	4	TOX 1100	Tox. Orien.	1	CHM 1122	Gen. Chem.	5
			PAH 1135	Prof. Dynamics in Hlth. Care Deliv. Sys.	4			

Second Year

Quarter 4			Quarter 4A (entire class)			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
PHY 1201	Physics	4	PHY 1203	Physics	4	PAH 1280	Gen. Biochem.	5
CHM 1264	Org. Chem.	5	CHM 1265	Org. Chem.	5	MTH 1150	Prob. Stat.	4
PAH 1202	Anat. & Phys. I	5	PAH 1204	Anat. & Phys. II	5	MLS 1151	BS Cl. Chem.	5
	Elective	4					Elective	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
BIO 1120	Microbio.	4	PCL 1420	Phrml. Med. Chm. II	6
PMC 1418	Med. Chm. Phrm. I	4	TOX 1300	Toxicology I	4
PCL 1410	Pathology	4	PCL 1450	Pharmacol. Lab	1
			TOX 1321	Biochem. Tox.	3

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
PCL 1422	Pharmacol. Med.	6	TOX 1801	Special Topics	4
	Chem. III		TOX 1300	Tox. I or Elective	4
PCL 1452	Pharmacol. Lab II	1	CHM 1461	Id. Org. Comp.	3
TOX 1305	Tox. II	5		A. & S. Elective	4
TOX 1321	Biochem. Tox.	3			
PMC 1321	Pharm. Anal. or	4			
CHM 1221	Anal. Chem.	4			

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
TOX 1302	Tox. III	4	HSL 1506	Comm. Health	4
PCT 1440	Bio. Pharm./Pharm.	4		Elective	4-8
CHM 1431	Inst. Analysis	5		Tox. Colloq.	3
	Elective	4	AFR 1115	Epidemiology	4
			PCL 1505	Drug Intrac.	4

English 1340 Writing Workshop—Middler year writing requirement can be filled by taking English 1340 upon completion of 80 Q.H. beginning with the class of 1989.

University College

Alternative Freshman-Year Program

Business Track: One-Year Program¹

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1000	Math I*	4	MTH 1010	Math II*	4	MTH 1113	Math for Bus.*	4
ENG 4013	Fund. of Eng. I	4	ENG 4014	Fund. of English II	4	HST 4111	Hist. of Civ. B	4
ED 4003	Int. Language	4	ED 4004	Int. Language	4	MGT 4110	Survey of Bus.	4
	Skills Dev. I			Skills Dev. II	6	ECN 4601	Economics I or	4
	Directed Elec.**	4	HST 4110	Hist. Civ. A or Directed Elective**	4		Directed Elective	

¹January admission: same courses offered Winter, Spring, Summer quarters.

Criminal Justice, Education, or Arts and Sciences Track: One-Year Program

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1000	Math 1*	4	SOC 4010	Sociology I	4	SOC 4011	Sociology II	4
ENG 4013	Fund. of Eng. I	4	ENG 4014	Fund. of English II	4	HST 4111	Hist. of Civ. B	4
ED 4003	Int. Language	4	ED 4004	Int. Language	4	POL 4106	Intro. to Politics	4
	Skills Dev. I			Skills Dev. II			Elective	4
	Directed Elec.**	4	HST 4110	Hist. Civ. A or Directed Elective**	4			

Health Sciences Track

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
MTH 1010	Math. II	4	MTH 1106	Fund. of Math.	4	BIO 1140	Basic Animal Bio. I	4
ENG 4013	Fund. of Eng. I	4	CHM 1111	Gen. Chem. I	5	CHM 1112	General Chem. II	5
CHM 1110	Pre-Chemistry	5	ED 4002	Int. Language	2		Directed Elective	4
ED 4001	Int. Language	2		Skills Dev. II			Directed Elective	4
	Skills Dev. I		ENG 4014	Fund. of English II	4			

Quarter 4

No.	Course	Q.H.
BIO 1141	Basic Animal Bio. II	4
MTH 1107	Functions & Calc.	4
	Directed Elective	4

*Mathematics courses will vary depending on placement tests.

**Eligible students may take HST 4110 (Q1) followed by an elective (Q2).

The Writing Center

Telephones: 437-2328 437-3086

The Writing Center offers one-to-one tutorial help in writing to all students and staff at Northeastern University. It will help students find a topic, organize and develop ideas, learn how to edit and proofread for problems in grammar, punctuation, and spelling. The Writing Center is open Monday through Friday from 9:00 a.m. to 4:00 p.m. To get help at the Writing Center, stop by room 102 Cahners to make an appointment.

MIDDLER YEAR WRITING REQUIREMENT

1986–1987

The Middler Year Writing Requirement (MYWR) is effective for freshmen who entered the University in fall 1984 and after and for transfer students who entered in fall 1985 and after. All Middlers (i.e., students, including nonco-op students, who have earned 80+ quarter hours) must complete this graduation requirement at Northeastern. Successful completion of Freshman English is a prerequisite. To complete the Middler Year Writing Requirement, students must earn a grade of C (2.0) or better in a four-credit writing course or a pass in a one-credit, pass/fail Writing Workshop.

This University requirement was instituted to help students write better in their major courses and in their professional workplaces. The four primary courses (see below) are therefore designed to be interdisciplinary so that students may write in subjects related to their majors or other related topics.

Guidelines for completing the Middler Year Writing Requirement for each college follows.

College of Arts and Sciences

For the 1986–1987 academic year, Intermediate Writing (ENG 1350) is the *strongly* recommended course for all Arts and Sciences students to fulfill the Middler Year Writing Requirement. Students may, however, also satisfy the requirement by taking a four-credit writing course from an approved MYWR list in the English or Journalism departments.

Boston-Bouve College Of Human Development Professions requires that students complete the Middler Year Writing Requirement as follows: Health, Sport, and Leisure Studies majors will take a four-credit writing course from the approved MYWR list. Physical Therapy majors will take either a four-credit writing course from the approved MYWR list or a one credit writing workshop (ENG 1340) in the *senior* year; all other majors will take either a four-credit writing course from the approved MYWR list or a one-credit writing workshop (ENG 1340) in the *middler* year.

College of Business Administration

The College of Business Administration has designated Writing for the Professions: Business Administration (ENG 1381) as the MYWR course for business majors.

College of Computer Science

The College of Computer Science Middlers are required to take Technical Writing (ENG 1125) in the spring or summer quarter to fulfill the MYWR.

College of Criminal Justice

The College of Criminal Justice has designated Intermediate Writing (ENG 1350) as the *primary* course that students will be required to take to fulfill the MYWR. In exceptional circumstances, another writing course may be substituted with the permission of the Dean of the College through the petition process.

College of Engineering

Chemical, civil, and industrial engineering students will take Technical Writing (ENG 1125) and mechanical and electrical engineering students will take Writing Workshop (ENG 1340) to fulfill the MYWR.

College of Engineering Technology

All students in the College of Engineering Technology will take Writing Workshop (ENG 1340) in the Middler Year to complete the MYWR.

College of Nursing

The College of Nursing has designated Intermediate Writing (ENG 1350) in the Fall and Winter Quarters of the Junior Year as the MYWR course.

College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions has designated Writing Workshop (ENG 1340) as the MYWR course.

MIDDLER YEAR WRITING REQUIREMENT list:

Primary Courses:

ENG 1350 Intermediate Writing
 ENG 1381 Writing for the Professions: Business Administration
 ENG 1125 Technical Writing
 ENG 1340 Writing Workshop

Approved Four-Credit Writing Courses:

ENG 1351 Creative Writing
 ENG 1352 Advanced Writing
 ENG 1358 Fiction Workshop
 ENG 1359 Nonfiction Workshop
 ENG 1360 Topics in Writing: Reading and Writing Nonfiction
 ENG 1370 Technical Writing II
 ENG 1371 Writing for the Computer Industry
 ENG 1380 Writing for Professions: Health Professions
 ENG 1382 Writing for Professions: Criminal Justice
 JRN 1320 Radio Newsgathering and Writing
 JRN 1421 Television Newswriting
 JRN 1432 Local Government Reporting
 JRN 1451 Advertising Copywriting
 JRN 1460 Public Relations Practice

All of these courses, if taken to complete the Middler Year Writing Requirement, have as prerequisites the successful completion of Freshman English and 80+ quarter hours. Consult your College advisor or the MYWR Office (433 HO) if you have any questions.

SPECIAL NOTE

Classes at Northeastern University are scheduled in different modules.

In assessing quarter weights for courses, the following statement applies: *One quarter-hour of credit is equal to 50 minutes of instruction per week, plus two hours of preparation.*

The Scheduling Office (126 HA) maintains all quarter-hour weights for courses. In the event of error in any publication, the academic record will reflect the correct quarter hours applicable to any degree requirement.

Some course titles may change, but the course number remains the same. Be sure you do not register for a course you may have already taken.

Basic College Compensatory Programs for 1986-1987

The Basic College Compensatory Program generally encompasses six courses, each bearing four quarter hours of credit, which are to be offered in the sequences indicated below. Certain freshmen may be assigned to any one of these course sequences as applicable on the basis of testing administered during orientation week, precollegiate academic credentials, or, in English, performance in C ENG 1110, Freshman English I. The same sequence is offered Winter/Spring for freshmen who enter in January.

Quarter 1:

MTH 1000 Mathematical Preliminaries I
 ENG 1110 Freshman English I or
 ENG 1013 Fundamentals of English I
 ED 1003 Reading/Study Skills

Quarter 2:

MTH 1010 Mathematical Preliminaries II
 ENG 1014 Intensive Writing

Specifically, MTH 1000 and MTH 1010 are to precede both the MTH 1106, MTH 1107, and MTH 1108 (nonbusiness math) sequence and the MTH 1113, MTH 1114, and MSC 1199 (business math) sequence. Certain freshmen may be assigned to ENG 1013 and ENG 1014, as applicable, on the basis of precollegiate academic credentials or may be assigned to ENG 1014 (Intensive Writing) on the basis of their performance in ENG 1110 (standard Freshman English I). Students must earn a C or better grade in ENG 1014 or ENG 1110 to proceed to ENG 1111(standard Freshman English II), the ENG 1111- ENG 1113 sequence for Engineers, and, in the case of Lincoln College, the ENG 1111- ENG 1114 (freshman Technical Writing) sequence. Students whose work in ENG 1110 is unacceptable for success in ENG 1111, Freshman English II, will receive a grade of S and must complete ENG 1014.

Schedule for Continuation of Compensatory Programming in the Basic Colleges for 1986-1987

These courses are approved or disapproved for credit, except where noted, by the faculties of the individual colleges and are, therefore, subject to change.

	C ENG 1110* or C ENG 1013* [for native Eng- lish speakers]				
	Writing I	<i>ENG 1014*</i> Writing II	<i>MTH 1000*</i> Math Prelim. I	<i>MTH 1010*</i> Math Prelim. II	<i>ED 1003 Read./</i> Study Skills
Arts and Sciences	accepted	accepted	accepted	accepted	accepted
B-B Phys. Ther.	not accepted	not accepted	not accepted	not accepted	not accepted
Phys. Educ.	accepted	accepted	accepted	accepted	accepted
Rec. and Leis. Stud.	accepted	accepted	not accepted	not accepted	not accepted
Health Educ.	accepted	accepted	accepted	accepted	accepted
Bus. Admin.	accepted	accepted	accepted	accepted	not accepted
Crim. Justice†	accepted	accepted	accepted	accepted	accepted
Education	accepted	accepted	accepted	accepted	accepted
Engineering‡	not applicable	not applicable	not applicable	not applicable	not applicable
Engineering Technology	accepted	accepted	not applicable	not applicable	not applicable
Nursing B.S.	accepted	accepted	not accepted	not accepted	not accepted
Pharmacy and§	accepted	accepted	not accepted	not accepted	not accepted
Allied Health Prof.	w/o credit				
Computer Science‡	not applicable	not applicable	not applicable	not applicable	not applicable

*When graded pass/fail and therefore not included in the student’s quality-point average.

†Freshmen in the College of Criminal Justice are not required to take a mathematics course in the freshman year. They can elect, however, to take MTH 1000 or MTH 1010 to prepare themselves for Fundamentals of Mathematics MTH 1106 as upperclassmen.

‡Although the Colleges of Engineering and Computer Science do not allow MTH 1000 or MTH 1010 to be taken for academic credit, they do offer a special course sequence in college calculus with algebra and trigonometry (MTH 1120 and MTH 1121) for engineering freshmen judged to have deficiencies in mathematics. The courses involve extra hours of work but cover the same material as the regular freshman calculus sequence in the College of Engineering.

§Although the College of Pharmacy and Allied Health Professions does allow ENG 1013 or ENG 1110 (with a grade of S) to appear on the permanent record, it will only allow ENG 1110 or ENG 1014 (with a letter grade) for credit. Students completing the ENG 1110-ENG 1014 or ENG 1013-ENG 1014 sequence will have to make up the four-credit elective that was displaced by ENG 1110 or ENG 1013.

Chemical Engineering

The course descriptions listed under Chemical Engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term. In addition to meeting course prerequisites, students are expected to take each chemical engineering course in the sequence shown on the specimen program sheet.

CHE 1201 Chemical Engineering Calculations I

4 Q.H.*

(Prereq. CHM 1132 and CHM 1138)

This course examines application of fundamental laws of mass and energy conservation to chemical and physical processes. In this course the primary emphasis is on material balances. A computational laboratory is included to aid students in improving facility in handling problems typical of the course.

CHE 1205 Computation Lab

2 Q.H.*

(Prereq. Taken with CHE 1201)

Laboratory sessions to aid student in problem formulation and solution. The assignments are based on material presented in CHE 1201. Emphasis is placed on computer software applications.

CHE 1211 Chemical Engineering Thermodynamics I

4 Q.H.

(Prereq. CHE 1201 and CHE 1205)

Topics include the first law and its application to batch and flow systems, heat effects in chemicals, and physical properties of real fluids. Fundamental principles and mathematical relations are applied to the analyses of and solutions to a variety of engineering problems.

CHE 1300 Chemical Engineering Calculations II

(Prereq. CHE 1201 and CHE 1211)

4 Q.H.

This course emphasizes energy balances and the simultaneous application of mass and energy conservation laws in steady and unsteady state processes. Problems are selected from chemical processing industry applications.

CHE 1310 Chemical Engineering Thermodynamics II

(Prereq. CHE 1300)

4 Q.H.

This course covers thermodynamic properties of mixtures; fugacity and the fugacity coefficients from equations of state for gaseous mixtures; liquid phase fugacities and activity coefficients for liquid mixtures; phase equilibria; the equilibrium constant for homogeneous gas-phase reactions; and extension of theory to handle simultaneous reactions, heterogeneous reactions, and reactions in solution.

CHE 1320 Momentum Transport

4 Q.H.

(Prereq. CHE 1300)

This course includes physical properties of fluids, pipe flow for process application, macroscopic balances and their application, microscopic balances, and introductions to boundary layer and turbulent flow theory.

CHE 1401 Transport Phenomena I

4 Q.H.

(Prereq. CHE 1301)

The mechanisms of momentum transport in fluid-flow phenomena are described. Velocity distributions for

Newtonian fluids in the laminar and turbulent flow regimes are derived and utilized in the analysis of elementary fluid-flow problems.

CHE 1402 Transport Phenomena II

4 Q.H.

(Prereq. CHE 1401 and CHE 1302)

Mass and heat transport by the mechanisms of molecular and bulk motion are described. A variety of elementary physical and chemical transport problems are analyzed in terms of these mechanisms.

CHE 1410 Experimental Methods I

4 Q.H.*

(Prereq. CHE 1302)

Experimental approach to solving chemical engineering problems and preparing reports to detail the results and their interpretations. Experiments illustrating the fundamental unit operations are performed.

CHE 1411 Experimental Methods II

4 Q.H.*

(Prereq. CHE 1410)

A continuation of CHE 1410, requiring more advanced experimentation and more sophisticated reports.

CHE 1421 Chemical Engineering Kinetics

4 Q.H.

(Prereq. CHE 1420)

Topics include fundamental theories of the rate of chemical change in homogeneous reacting systems; integral and differential analysis of kinetic data; design of batch and continuous-flow chemical reactors; introduction to heterogeneous reactions and reactor design.

CHE 1430 Heat Transport

4 Q.H.

(Prereq. CHE 1310 and CHE 1320)

Fundamentals of heat transport are presented; design of heat transfer equipment and estimation of heat transfer rates is also covered.

CHE 1440 Separation Processes

4 Q.H.

(Prereq. CHE 1430 and CHE 1421)

This course describes the principles utilized in the physical separation of chemical mixtures. Separation techniques covered include filtration, evaporation, extraction, and distillation. The concept of equilibrium stages is introduced and applied to the separation of binary mixtures by liquid-liquid extraction and by continuous distillation.

CHE 1450 Chemical Engineering Economics

4 Q.H.

(Prereq. ENC 1115)

Financial decision-making techniques are introduced and applied to problems of production, storage, transportation, and utilization of chemical resources to meet societal needs.

* Lab fee required.

CHE 1501 Process Design I 6 Q.H.*
(Prereq. CHE 1402 and CHE 1420)

Process design of a chemical plant. Topics include process selection, material and energy balances, equipment selection and/or design, elements of instrumentation, flowsheets, and cost estimates.

CHE 1502 Process Design II 6 Q.H.*
(Prereq. CHE 1501)

This course is a continuation of CHE 1501. A more complex design is required. Additional elements of process design are studied.

CHE 1503 Projects I 6 Q.H.*
(Prereq. Senior standing and consent of Dept.)

This course offers individual research related to some phase of chemical engineering. Open only to students selected by the department head on the basis of scholarship and proven ability.

CHE 1504 Projects II 6 Q.H.*
(Prereq. CHE 1503)

The course offers a continuation of the research work undertaken in CHE 1503.

CHE 1510 Principles of Nuclear Engineering 4 Q.H.
(Prereq. Senior standing)

The course offers an introduction to the principles of nuclear engineering. Elements of nuclear physics, reactor physics, and radiation safety are presented, together with engineering techniques specific to the nuclear industry.

CHE 1511 Mathematical Methods in Chemical Engineering 4 Q.H.
(Prereq. Senior standing)

The course examines formulation and solution of problems taken from chemical and engineering studies that require advanced mathematical methods. Emphasis is placed primarily on the formulation step, although numeric and analytic solution techniques for solving sets of algebraic equations and for solving ordinary and partial differential equations are discussed.

CHE 1512 Chemical Process Control 4 Q.H.
(Prereq. CHE 1411 and CHE 1440)

The course focuses on principles of automatic control with applications to chemical processing systems. Topics such as process modeling and control system design are included.

CHE 1513 Introduction to Optimization 4 Q.H.
(Prereq. Senior standing)

Elementary optimization techniques, such as gradient methods, pattern search, linear programming, and dynamic programming, are described and applied to a variety of elementary physical and chemical problems.

CHE 1514 Special Topics 4 Q.H.
(Prereq. Senior standing)

Chemical engineering topics of interest to the staff member conducting the class are presented for study.

CHE 1515 Chemical Energy Economics 4 Q.H.
(Prereq. Senior standing)

Financial decision-making techniques are introduced and applied to the problems of production, transportation, and utilization of chemical energy resources such as petroleum, natural gas, coal, and shale oil.

CHE 1516 Mass Transfer Operations 4 Q.H.
(Prereq. Senior standing)

Course focuses on calculation and design methods used in processes involving mass transfer. Topics covered include vapor-liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption, and extraction.

CHE 1517 Analysis of Chemical Processes 4 Q.H.
(Prereq. CHE 1420, CHE 1421, and senior standing)

Course focuses on methods and reactions used for making chemical products on a large scale. Topics covered include types of physical and chemical equilibria, flow-sheet patterns, energy management, and catalytic and noncatalytic rate problems. A number of situations involving simultaneous application of the above topics in process analyses are studied.

CHE 1518 Management in the Chemical Industries 4 Q.H.
(Prereq. Senior standing in engineering)

The course focuses on principles of management as applied to the chemical process industries. Case studies are used to supplement lectures and discussion.

CHE 1519 Kinetics of Polymerization Process 4 Q.H.
(Prereq. CHE 1421, CHM 1262, and senior standing)

The course focuses on the mechanisms by which polymeric materials are assembled via chemical reaction. Reaction-rate models based on these mechanisms are utilized to investigate the effect of reaction parameters on the chemical and physical structure of the polymeric product. The specific polymerization processes considered are free radical addition, condensation, and ionic.

CHE 1520 Pollution Control In Chemical Industries 4 Q.H.
(Prereq. Senior standing)

Students are instructed in fundamental operations for handling environmental problems in the chemical process industries. Water quality requirements and industrial waste characteristics are discussed.

CHE 1521 Chemical Process Development 4 Q.H.
(Prereq. Senior standing)

The course offers a study of the manner in which a chemical process evolves from the research laboratory to full-scale production. Typical processes are used as illustrations. Topics covered include economic factors, safety factors, batch vs. continuous operation, process evaluation, developing the flow sheet, and scale-up considerations.

*Lab fee required.

CHE 1522 Corrosion Engineering**4 Q.H.**

(Prereq. Senior standing)

The course covers the fundamentals of corrosion engineering: theories of corrosion, corrosion testing, corrosion protection, and selected relevant topics.

CHE 1523 Catalysis**4 Q.H.**

(Prereq. Senior standing)

The course offers an introduction to heterogeneous catalytic processes. Topics include mechanistic explanations and modeling of catalyzed reactions. The course culminates with application of catalysts to industrial practice.

Civil Engineering

The course descriptions listed under Civil Engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

CIV 1210 Structural Mechanics I**4 Q.H.**

(Prereq. PHY 1222; MTH 1227 concurrently)

Topics normally include statics of particles and rigid bodies in two and three dimensions; analysis of internal forces in trusses and beams; centroids and centers of gravity of lines, area, and volumes; moments of inertia of areas and masses.

CIV 1211 Structural Mechanics II**4 Q.H.**

(Prereq. CIV 1210)

Course material includes analysis of stress and strain; mechanical properties of materials; elastic analysis of stresses and deformations of members subject to axial load, torsion, shear, and moment; introduction to column behavior.

CIV 1212 Structural Mechanics III**4 Q.H.**

(Prereq. CIV 1211)

Continuation of CIV 1211. Topics include torsion, general bending, curved members, shear flow, shear center, combined stresses including elastic and plastic behavior, continuation of column buckling, and introduction to yield and fracture criteria.

CIV 1220 Structural Analysis I**4 Q.H.**

(Prereq. CIV 1211)

Topics normally include review of reactions, shear and bending moment diagrams, bar forces in trusses, deflections by virtual work and moment area methods; and analysis of indeterminate structures by consistent deformations, slope deflection, and moment distribution.

CIV 1222 Structural Analysis I**4 Q.H.**

(Prereq. CIV 1220)

This course concentrates on matrix analysis of indeterminate structures using both flexibility and stiffness approaches; computer applications to analysis of framed structures.

CIV 1224 Structural Analysis III**4 Q.H.**

(Prereq. CIV 1220)

This course is a continuation of CIV 1220. Topics normally include slope deflection; moment distribution; effects of axial loads; symmetry; antisymmetry; nonprismatic members; influence lines for determinate and indeterminate structures, approximate methods of lateral load analysis and shear wall action.

CIV 1226 Structural Analysis & Design Lab**2 Q.H.**

(Prereq. CIV 1220 taken concurrently)

Course material includes lectures, experimental studies, computation laboratories, and computer projects to develop student's knowledge of structural behavior and understanding of the design and analysis of structures.

CIV 1240 Design of Reinforced Concrete Structures I

(Prereq. CIV 1220)

4 Q.H.

Course material includes review of mechanical properties of steel and concrete; behavior and design of reinforced concrete beams for shear, moment, and bond; design of stocky columns for axial load and moment. Emphasis of course is on strength design.

CIV 1241 Design of Reinforced Concrete Structures II

(Prereq. CIV 1240)

4 Q.H.

Topics normally include design of slender columns, foundations, multistory buildings with one-way and two-way floor systems.

CIV 1250 Design of Steel Structures I**4 Q.H.**

(Prereq. CIV 1220)

The course focuses on design of steel members subject to tension, compression, bending, and combinations of loading; design of connections, braced frames, and rigid frames.

CIV 1251 Design of Steel Structures II**4 Q.H.**

(Prereq. CIV 1250)

Topics normally include design of steel plate girders, composite construction in bridges and buildings, plastic analysis and design, and the design of high-rise buildings subject to lateral loads.

CIV 1310 Fluid Mechanics**4 Q.H.**

(Prereq. CIV 1210)

The course gives an introduction to both the statics and dynamics of fluid mechanics. Topics include properties of fluids; pressure variation in water and air; pressure force on surfaces and submerged bodies, continuity, momentum and energy principles; dimensional analysis and hydraulic similitude; flow in closed conduits, frictional and local losses in pipes and systems; problems in steady flow.

CIV 1320 Hydraulic Engineering**4 Q.H.**

(Prereq. CIV 1310)

The course covers a variety of topics including: pipe networks; water hammer; pumps, pump selection; pipe-pump combinations; flow in open channels, uniform flow, gradually varied flow, hydraulic jump; drag forces on bodies; principles of hydrology, unit hydrograph, and rainfall-runoff relationships; and some aspects of ground water and well hydraulics.

CIV 1340 Environmental Engineering I**4 Q.H.**

(Prereq. CHM 1132)

The course focuses on engineering approaches to protection and management of the environment. Topics include assessment of environmental quality; introduction to water and wastewater technology, air pollution control, and solid waste management.

CIV 1341 Environmental Engineering II**4 Q.H.**

(Prereq. CIV 1340 and CIV 1310)

The course concentrates on development of fundamental physical, chemical, and biological phenomena of water and wastewater systems with engineering applications in water technology from source to ultimate disposal.

CIV 1350 Environmental and Hydraulics Lab**4 Q.H.**

(Prereq. CIV 1340; CIV 1320 concurrently)

The course includes lectures, laboratory and field experiments in environmental and hydraulic engineering. Experiments in hydraulics area include: fluid properties, hydrostatics, drag forces, flow in pipes and channels as well as pumps and turbines. Experiments in the environmental area include physical, chemical, and biological analyses normally used by environmental engineers. Field experiments are coordinated to allow collection of environmental and hydraulic data concurrently.

CIV 1360 Environmental Design**4 Q.H.**

(Prereq. CIV 1320, CIV 1341)

The course consists of several individual design projects in environmental engineering affording the student an opportunity to develop a sound engineering approach to water and wastewater management at the municipal level. Projects are given careful critique. There is one group project requiring an oral presentation.

CIV 1370 Air Pollution**4 Q.H.**

(Prereq. Seniors only)

The course focuses on theory and practice related to engineering management of air resources; microclimate and dispersion of pollutants; atmospheric chemistry; air pollution instrumentation; control of gaseous and particulate emissions; design of air pollution control systems; biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment; physiological effects of aerosols; analysis of organic and inorganic constituents of the atmosphere; and rationale for establishment of air quality criteria and standards.

CIV 1390 Survey of Environmental Problems**4 Q.H.**

(Prereq. Nonengineers only; permission of instructor)
A survey of problems associated with man's use of the environment. Course material includes interrelation of the air-water-land complex, with emphasis on ecological stresses produced, and methodologies for assessing and controlling man's environmental impact.

CIV 1410 Soil Mechanics**4 Q.H.**

(Prereq. CIV 1211 and CIV 1310)

Course material includes soil classification, soil-water phase relations, ground water seepage, consolidation theory, strength properties of soils, stress distributions in soils due to surface loads, slope stability.

CIV 1411 Soil Mechanics Lab**2 Q.H.***

(Taken concurrently with CIV 1410)

The course focuses on laboratory exercises, including soil classification, seepage, shear strength, consolidation, and triaxial testing.

CIV 1420 Foundation Engineering**4 Q.H.**

(Prereq. CIV 1410)

Topics normally include subsurface explorations, determination of soil-bearing capacity, design of shallow foundations, pile and caisson foundations, design of retaining walls, anchored bulkheads and braced sheeting, and other selected topics on foundation design and construction.

CIV 1430 Geotechnology**4 Q.H.**

(Prereq. Juniors and seniors only)

An introduction to the geological sciences as they apply to civil engineering practice, the course focuses on the effects of significant geological features on location, design, construction, operation, and maintenance of engineering projects.

CIV 1510 Materials**4 Q.H.**

(Prereq. CHM 1132)

The course focuses on the structural, chemical, and mechanical properties of materials of importance to civil engineers; fundamental nature of matter; significance of phase transformations; control of microstructure; mechanisms of failure of materials.

CIV 1511 Materials Laboratory**2 Q.H.**

(Prereq. Taken concurrently with CIV 1510)

A laboratory in which standard tests and equipment are used to determine structural and mechanical properties of materials common to civil engineering practice: concrete, aggregates, steel, wood, asphalt, glass, etc.

CIV 1530 Transportation Analysis and Planning

(Prereq. Juniors and seniors only)

4 Q.H.

Course material covers history and policy issues in urban transportation; characteristics of different urban transportation models; fundamentals of bus and rail transit operations planning; fundamentals of urban highway operation; transportation systems manage-

* Lab fee required.

ment; and land use and demand modeling. Other topics that may be covered include environmental impact assessment, citizen participation, data collection, and transportation in developing countries.

CIV 1540 Highway Engineering 4 Q.H.
(Prereq. CIV 1620 and CIV 1410)

A general approach to highway engineering, topics normally include administration, economic factors, planning, environmental impacts, geometric design, drainage, and the design of flexible pavements.

CIV 1550 Construction Management 4 Q.H.
(Prereq. Seniors only)

An overall perspective of the construction industry and tasks that must be addressed by construction management, including resource allocation, construction environment, organization, contracts, funding, cash flow, productivity, labor relations, network planning and scheduling, construction accounting, and project control.

CIV 1610 Computer Applications in Civil Engineering 4 Q.H.
(Prereq. GE 1100)

Introduction to problem solving methods in civil engineering, especially those requiring a data processing machine. Examples of civil engineering problems are introduced and methods of solution discussed. Students are assigned several projects in implementing solution techniques on computers. Proficiency in computing, problem solving, documentation, and presentation is acquired by critiquing and classroom discussion.

CIV 1620 Engineering Measurements 4 Q.H.
(Prereq. MTH 1124 and PHY 1222)

The mathematics and instrumentation used in land surveying for obtaining measurements of distance, elevation, and direction, and the methodology applied for traverses, areas, coordinate systems, horizontal and vertical curves, earthwork, and topographic mapping.

CIV 1621 Engineering Measurements Laboratory 2 Q.H.*
(Prereq. GE 1100)

Taken simultaneously with CIV 1620, the course consists of field problems illustrating and applying the lecture material in CIV 1620, with computer applications.

CIV 1630 Civil Engineering Systems 4 Q.H.
(Prereq. MTH 1227)

The course covers application of system synthesis and optimization techniques for civil engineering students; calculus method, linear programming, network analysis, and dynamic programming.

CIV 1640 Applied Probability Theory for Civil Engineers 4 Q.H.
(Prereq. MTH 1227)

Topics normally include applications of probability theory to civil engineering problems, probabilities of events, random variables and distributions, derived distributions, expectation, common probability models, and an introduction to statistics.

CIV 1650 Legal Aspects of Civil Engineering 4 Q.H.
(Prereq. Seniors only)

Business law for the engineering organizations, including description and evaluation of various types of contracts for engineering services and construction, procedures for submitting bids, procedures for claims and legal steps to minimize risk exposure, both in U.S. and international business.

CIV 1810 Special Topic In Civil Engineering 4 Q.H.
(Prereq. Permission of instructor)

This is a special course within the field of civil engineering initiated by the appropriate discipline committee and approved by the department.

CIV 1820 Special Project in Civil Engineering 4 Q.H.
(Prereq. Outstanding academic performance)

The course offers individual study in an area within the field of civil engineering, selected by the student and his or her instructor with approval by the appropriate discipline committee, resulting in a definitive report and an oral presentation.

Electrical Engineering

The course descriptions listed under Electrical Engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

ECE 1101 E.E. Lab 1-A Circuits and Systems I Laboratory 1 Q.H.*
(Prereq. PHY 1223)

Design and confirmation testing of elementary circuits containing both LTI circuit elements and other components which are either nontime invariant or nonlinear. Measurement techniques are developed to meet specific design problems.

ECE 1102 E.E. Lab 1-B Electronics I Laboratory 1 Q.H.*
(Prereq. ECE 1101)

Design and confirmation testing of elementary digital circuits. Included are designs of gates themselves as well as the assembly of simple functional blocks such as decoders, registers, and flip-flops.

*Lab fee required.

ECE 1103 E.E. Laboratory I-Measurements

(Prereq. ECE 1211)

2 Q.H.*

The course covers basic electrical measurements; report writing, use of standard laboratory instruments, including digital voltmeters, oscilloscopes, and bridges.

ECE 1171 Electrical Engineering I**4 Q.H.**

(Prereq. MTH 1128; not open to electrical engineering majors)

Introductory course to electric circuit theory covers Kirchhoff's laws, loop and nodal analysis, Thevenin's theorem, power and energy, exponential excitation and the system function.

ECE 1172 Electrical Engineering II**4 Q.H.**

(Prereq. ECE 1171; not open to electrical engineering majors)

Properties and analysis of electronic devices, circuits, and systems; elements of control systems; principles of energy conversion. Emphasis on each topic determined according to major discipline.

ECE 1173 Power Systems and Controls**4 Q.H.**

(Prereq. ECE 1171)

Basic concepts of electromechanical energy conversion stressing the terminal characteristics and operation of d-c and a-c machines, elements of power distribution systems, and concepts of feedback control, with application to power systems and plant control.

ECE 1174 Basic Electrical Instrumentation

(Prereq. ECE 1171)

4 Q.H.*

Basic electrical measurement devices, including ammeters, voltmeters, oscilloscopes, and bridges; instrumentation techniques such as direct measurement, comparative measurement, and analog methods. Application to nonelectrical disciplines is included.

ECE 1175 Modelling Techniques**4 Q.H.**

(Prereq. ECE 1171 and ECE 1172; also FORTRAN IV programming)

Introduction to the concept of modelling techniques to represent physical, biological, and social systems; electrical analogs and use of analog computers; introduction to digital modelling and the use of digital computation.

ECE 1191 Introduction to Digital Computers I:**Design and Organization****4 Q.H.**

(Prereq. PHY 1223 and MTH 1128)

Introduction to the basic components of digital systems and methods for their analysis and design: logic gates and flipflops, Boolean algebra, and combinational and sequential circuits. Integrated circuit logic families and functional building blocks: registers, counters, decoders, multiplexers, and memories. Data representation and coding techniques. Register-transfer language for specification of instruction sets, processor organization, and logic design. Case study of a specific central processor instruction set implementation. Assembly language programming techniques and introduction to system software.

ECE 1192 Introduction to Digital Computers II:**Fundamentals of Computation Structures****4 Q.H.**

(Prereq. ECE 1191)

Central processor alternatives: instruction formats, addressing modes, bus structures, arithmetic units, timing analysis, and stacks. Algorithms for arithmetic operations with various data representations. Input-output and memory organization. Introduction to microprocessors. This course, like its predecessor ECE 1191, is oriented toward the design, not just the comprehension, of digital systems likely to be encountered by the electrical engineer.

ECE 1211 Circuits and Systems I**4 Q.H.**

(Prereq. MTH 1128 and PHY 1223)

The course covers circuit elements (linear, non-linear, time-invariant, and time-varying), sources (independent and controlled), Kirchhoff's laws, Tellegen's theorem, Thevenin's theorem, network topology, mesh and nodal analysis.

ECE 1212 Circuits and Systems II**4 Q.H.**

(Prereq. ECE 1211)

Topics include linearity and time-invariance, system function, forced and force-free response of networks and LTI systems, singularity response, partial fraction expansion, "pre-box" concept, and convolution.

ECE 1213 Circuits and Systems III**4 Q.H.**

(Prereq. ECE 1212)

Topics include Thevenin's theorem revisited, magnitude and phase plots, resonance, two-port networks, energy and power and convolution.

ECE 1214 Circuits and Systems IV**4 Q.H.**

(Prereq. ECE 1213)

The course focuses on basic concepts and techniques of linear system theory. Review of system theory in terms of the convolution integral; waveform representation in terms of the Fourier series, Fourier Integral, and the bilateral Laplace transform; system concepts in terms of the function and their application to filters and feedback systems.

ECE 1215 Circuits and Systems 1**4 Q.H.**

(Prereq. MTH 1127, PHY 1223)

Topics include electric circuit elements, sources, Kirchhoff's laws, Tellegen's theorem, Thevenin's theorem, mesh and node equations, power and energy, linearity and time invariance, response to exponential excitations, system function.

ECE 1216 Circuits and Systems 2**4 Q.H.**

(Prereq. ECE 1215)

Topics include forced and force-free response of networks, singularity response, "pre-box" concept, classical a-c response, application of Laplace transform to circuit problems and determination of initial conditions, driving-point and transfer functions of circuits.

ECE 1217 Circuits and Systems 3**4 Q.H.**

(Prereq. MTH 1228, ECE 1216)

Power and energy, reciprocity, magnitude and phase

* Lab fee required.

plots, n-port network theory. Frequency domain analysis of circuits, stability considerations. The concept of state variables for networks, natural frequencies, and eigenvalues.

ECE 1218 Circuits and Systems 4 **4 Q.H.**
(Prereq. ECE 1217, ECE 1332)

Continuation of state variables for active and passive networks, noise considerations and linear filters. Nonlinear, and time-varying linear systems. Introduction to distributed systems.

ECE 1219 Circuits and Systems A **6 Q.H.**
(Prereq. MTH 1128 and PHY 1223)

Includes the material covered in course ECE 1211, Circuits and Systems I, plus half of the material in course ECE 1212, Circuits and Systems II.

ECE 1220 Circuits and Systems B **6 Q.H.**
(Prereq. ECE 1219)

Completes the material in ECE 1212, Circuits and Systems II, plus the material in course ECE 1213, Circuits and Systems III.

ECE 1301 E.E. Lab 2-A Circuits and Systems III Laboratory **1 Q.H.***

(Prereq. ECE 1102)

Design and testing of simple systems for the analysis and modification of analog signals. The emphasis is on discrete methodologies whose implementation is achieved as a computer program. Included are designs of filters with specific characteristics and the spectral analysis through DFT's and the like. This laboratory's central purpose is to develop the understanding of the relationship between a filter as represented by a transfer function and that same filter as represented by the system which implements the transfer function.

ECE 1302 E.E. Lab 2-B Electronics III Laboratory **1 Q.H.***
(Prereq. ECE 1301)

Design and confirmation testing of some of the basic building blocks of analog integrated circuits. Variations on the Widlar current mirrors will be designed and explored and then used in the design of differential amplifiers employing integrated matched transistor pairs. One of the objectives of this laboratory is to explore the design advantages that arise from the inherent component matching of integrated circuits.

ECE 1303 E.E. Laboratory II-Circuits and Systems **2 Q.H.***
(Prereq. ECE 1212)

The course includes experiments relevant to the Circuits and Systems courses, together with more work in measurements.

ECE 1304 E.E. Lab 3-A Electronics IV Laboratory **1 Q.H.***

Design and confirmation testing of amplifier circuits employing discrete elements and packaged op-amps. The emphasis is on the stabilization and the control of the performance characteristics of such amplifiers through feedback. The student will be expected to design circuits using manufacturer's specifications and to demonstrate finished designs which will work

if the active devices are anywhere within the manufacturer's tolerances.

ECE 1305 E.E. Lab 3-B EM Field Theory II Laboratory **1 Q.H.***

(Prereq. ECE 1304)

Design and confirmation testing of linear antennas and arrays for specific directivity. Transmission line impedance matching and resonator section designs. Applications of Faraday's and Ampere's laws through CAD design of inductors, RF and power transformers, or electromechanical actuators.

ECE 1306 E.E. Laboratory III-Devices **2 Q.H.***

The course includes introduction to the digital computer, electro-optics, terminal characteristics of active devices.

ECE 1307 Senior Design Laboratory **2 Q.H.***
(Prereq. ECE 1361)

In this laboratory, small teams of students carry through an engineering development product from proposal through paper and CAD to construction and testing. Economic factors, component tolerances, production design, and acceptance testing are intrinsic components of successful projects. Many teams will work on the same project and the designs will be judged competitively. A typical project might be an addressable A/D converter properly interfaced to a particular microcomputer.

ECE 1331 Discrete Systems **4 Q.H.**
(Prereq. GE 1100)

Topics include historical review and future perspectives of discrete systems; representation of digital signals, quantization; introduction to digital filters, moving average filters; Z-transforms, inverse Z-transforms; recursive digital filters, stability considerations, steady-state and transient response; introduction to non-recursive techniques, the discrete Fourier transform, the fast Fourier transform; applications to computation of systems transfer functions.

ECE 1332 Discrete Systems **4 Q.H.**
(Prereq. GE 1100, ECE 1216)

Topics include historical review and future perspectives of discrete systems; representation of digital signals, sampling, quantization, introduction to digital filters, moving average filters; Z-transforms, inverse Z-transforms; recursive digital filters, stability considerations, steady-state and transient response; introduction to nonrecursive techniques, the discrete Fourier transform, the fast Fourier transform; applications to computation of systems transfer functions.

ECE 1333 Continuous Systems **4 Q.H.**
(Prereq. ECE 1217, ECE 1332)

The course focuses on basic concepts and techniques of continuous linear system theory. Topics include system theory in terms of the convolution integral; waveform representation in terms of the Fourier series, Fourier integral, and the bilateral

*Lab fee required.

Laplace transform; system concepts in terms of the system function and their application to filters and feedback systems.

ECE 1346 Electronics I **4 Q.H.**
(Prereq. ECE 1216)

This first course in electronics stresses the use of solid-state active devices in digital circuits.

The first part of this course introduces binary values, logic operations, flip-flops and registers from the viewpoint of symbolic logic gates, Boolean algebra and Karnaugh maps. The latter part of this course deals with solid-state devices for the realization of logic functions. Concepts of diodes are introduced followed by BJT and field-effect characteristics leading to the use of such devices in implementing Inverters, NAND and NOR gates for T²L, CMOS and NMOS logic families.

ECE 1347 Electronics II **4 Q.H.**
(Prereq. ECE 1346, ECE 1216; Coreq. ECE 1332)

This second course in electronics stresses the use of transistors, with emphasis on integrated devices in the design of analog circuits. Topics covered include biasing, linearized incremental model characteristics such as gain and impedance levels, Early effect, use of signal flowgraphs and frequency response for single and compound stages followed by an introduction to operational amplifiers.

ECE 1349 Electronic Design I **4 Q.H.**
(Prereq. ECE 1347)

This third course in electronics continues the design of analog circuits with emphasis on operational amplifiers. Topics include concepts of feedback, open- and closed-loop gain, effect of feedback on impedance levels, frequency response, stability and compensation in feedback systems. ECL is introduced from the viewpoint of feedback, followed by an analog/digital design example.

ECE 1350 Electronic Design II **4 Q.H.**
(Prereq. ECE 1349, ECE 1333)

This fourth course in electronic design is a continuation of the third course. It stresses the design of systems involving analog, digital and analog/digital approaches to signal acquisition and processing.

ECE 1361 Electromagnetic Field Theory I **4 Q.H.**
(Prereq. MTH 1225)

The course focuses on definition and representation of scalar and vector fields. Coordinate systems; elements vector calculus; definition of the concepts of gradient, divergence, curl, and the "del" operator, free-space electrostatics; definition of the electric field intensity; the scalar potential; solution to Poisson and Laplace equations; macroscopic model of dielectric materials; the electric polarization and the electric flux density vector; boundary conditions; Lorentz force; free space magnetostatics; magnetic vector potential and solution to the "vector" Poisson equation; macroscopic model of magnetic materials; magnetization and magnetic field intensity; boundary conditions.

ECE 1362 Electromagnetic Field Theory II **4 Q.H.**
(Prereq. ECE 1361)

Topics include generalization of the Maxwell equations to the case of time-varying fields; Faraday induction law; wave equations and the plane wave solution; Poynting theorem and the concept of energy stored by the fields; reflection and refraction of plane waves; time-harmonic wave equations for the scalar and vector potentials; time-harmonic form of retarded potentials; radiation from dipole; motion of charged particles in fields; magnetoionic media; elementary discussion of plasma physics and M.H.D.

ECE 1363 Electromagnetic Field Theory I **4 Q.H.**
(Prereq. ECE 1218, PHY 1223)

Starting with Maxwell's equations, the major areas of statics, dynamics, quasistatics, and material media are studied as special cases. Statics covers the study of the electrostatic and magnetostatic fields, including the scalar electric potential and vector magnetic potential. In dynamics, Faraday's law and Ampere's law are presented for time-varying electromagnetic fields. Quasi-statics introduces the concept of electromechanical coupling with applications to elementary energy conversion, both electric and magnetic devices. Material media covers the macroscopic model of dielectric materials, the electric polarization and the electric flux density vector; macroscopic model of magnetic materials, magnetization, and magnetic field intensity; and boundary conditions.

ECE 1364 Electromagnetic Field Theory II **4 Q.H.**
(Prereq. ECE 1363)

This course offers an introduction to the applications of electromagnetic field theory. From Maxwell's equations for time-varying fields, the following areas are developed: The concepts of waves and energy are explored, including plan wave propagation, waveguides and Poynting's theorem. Radiation is studied with emphasis on spherical waves and elementary scattering and application to antenna design. Distributed systems are treated in terms of waveguide circuit concepts, transmission lines and Smith chart techniques. Other applications in the optics and acoustics areas will be presented.

ECE 1371 Electrical Machines I **4 Q.H.**
(Prereq. ECE 1364, ECE 1333)

Review of electromagnetic field theory as applied to electromechanics; magnetic circuits, transformers and their circuit representations; principles of electromechanical energy conversion (state-variable formulation of electromechanical coupling, singly and multiply, excited magnetic-field systems, elementary concepts of rotating machines including transformer emf, speed emf, and torque production); steady-state theory and performance of basic rotating machines such as induction, synchronous, and d-c commutator machines through circuit-model concepts.

ECE 1372 Electrical Machines II 4 Q.H.

(Prereq. ECE 1371)

Dynamic behavior of electromechanical devices; transient performance of synchronous machines; synchronous and induction-machine dynamics; d-c machine dynamics.

ECE 1375 Electromechanical Dynamics 4 Q.H.

(Prereq. ECE 1363, ECE 1364)

The approximate form of Maxwell's equations for quasi-static electromagnetic fields is presented. The concept of the generalized inductance and capacitance is developed, followed by the definition of electric and magnetic field systems. Force and energy relations are introduced, followed by rotational and translational mechanical systems. The complete electromechanical system is presented in terms of a circuit model with a discussion of energy conversion. Applications include the electrodynamic loudspeaker, reluctance motors, a-c rotating machines with single or multiple excitation. The dynamic equations of motion are solved by linearization methods.

ECE 1376 Machines and Systems 4 Q.H.

(Prereq. ECE 1375)

The course offers a detailed investigation of the operating principles of synchronous machines, synchronous motor and generator power-angle characteristics, machine dynamics, machine and power system stability.

ECE 1377 Introduction to Electric Machinery

(Prereq. ECE 1361)

4 Q.H.

Topics include review of magnetic field, energy, and energy conversion concepts. Transformers and their circuit representations; application of energy conversion concepts to basic rotating machines and exploration of the Theory of Induction, synchronous, and d-c machines. Limitations in actual machines will be discussed.

ECE 1378 Transients in Electric Power Systems**4 Q.H.**

Introduction to the response of various elements of a power network to the transients caused by lightning, switching, and faults. Some of the equipment to be considered in terms of transient response include the transmission line, lightning arresters, fuses, transformers, and circuit breakers.

ECE 1379 Transients in Electric Power Systems

(Prereq. ECE 1333)

4 Q.H.

Introduction to transient response in electrical power systems. Topics include lightning; switching; faults; protection against transient overvoltages. Some of the equipment to be considered in terms of transient response include transmission lines, transformers, circuit breakers, surge arresters, and fuses.

ECE 1381 Computer Engineering I:**Digital Computer Architecture****4 Q.H.**

(Prereq. ECE 1346)

Introduction to the structure of programmable digital systems. Sequential circuits and functional building

blocks such as registers, counters, decoders, multiplexers, and memories. Data representation. Register transfer language specification of instruction sets and processor organization. Case study of a specific central processor instruction set implementation. Input-output and memory organization, bus structures and arithmetic units. Students complete a design project involving the assembly language programming of a microprocessor.

ECE 1382 Computer Engineering II:**Software Engineering****4 Q.H.**

(Prereq. ECE 1381, GE 1100 or equivalent)

Basic issues of systems software, from the point-of-view of structured software design, are considered. Topics covered include the modular design of assemblers, linkers, and macroprocessors. Basic techniques of software engineering are explored, including such concepts as error handling, program verification, unit testing, and documentation. A team project is assigned, with student groups of two or three implementing individual modules in a larger program. A student manager group is used as well. Projects are carried out on either large mainframes or laboratory microcomputer systems.

ECE 1383 Computer Engineering III:**Integrated Microcomputer-based Systems 4 Q.H.**

(Prereq. ECE 1382)

The course focuses upon understanding the operation of systems which contain a microcomputer as a key element. An important issue is the way in which the computer software is synchronized with the hardware components of the system to achieve coherent operation. A discussion of these interfacing techniques comprises the first half of the course. The rest of the course focuses on several specific applications. A typical example may be the design of a modern vehicle where the computer may control functions such as fuel regulation, optimization of engine speed, etc. A project is associated with the course that requires the student to design a device using the methodology discussed in class.

ECE 1384 Computer Engineering IV:**Computer-aided Design Methods in Electrical****Engineering****4 Q.H.**

(Prereq. ECE 1382, ECE 1364, ECE 1350, ECE 1218)

Use of packaged software and graphics facilities to implement realistic designs in electrical engineering. Applications include the design of antennae, wave guides, transmission lines, electric circuits, digital filters, and VLSI methods. Students are required to develop their own specialized software using available CAD tools.

ECE 1385 Computer Engineering V:**Introduction to Robotics****4 Q.H.**

(Prereq. ECE 1382, ECE 1383, ECE 1333)

Studies of intelligent interactions between machines and their environment with emphasis on sensory (vision)-driven locomotion and manipulation. Integration of sensors, manipulators and computers into

intelligent robotic systems. Vision, touch, force, position, proximity, and torque sensors and their role in adaptive control of robot movements. Computational needs of sensory data processing. VLSI implementation of data-driven architectures for low-level vision. Image processing and understanding as a means to developing symbolic models of the visual (sensory) world. Manipulator kinematics and dynamics. VLSI controllers for multicoordinate robotic systems. Robotic software tools, including high level language and decision-making functions. Real-time microprocessor networks and control hierarchies within the robot.

ECE 1386 Computer Engineering VI: Structure of Large-scale Computer Systems 4 Q.H.
(Prereq. ECE 1384)

Study of large-scale computer systems with applications to robotics, communications, artificial intelligence, and interactive computer design. The course consists of two major topics:

- 1) A global overview of distributed and parallel computing systems for problem solving, planning, massive data processing, etc., and
- 2) Examination of special purpose processors which constitute such complex systems including parallel hardware for image processing, industrial data acquisition and control systems, array processors, and knowledge-based systems.

ECE 1390 Senior Project Laboratory I 2 Q.H.*
(Prereq. ECE 1347 and ECE 1362)

In this course, students work with a faculty adviser on some term project, either experimental or theoretical.

ECE 1391 Senior Project Laboratory II 2 Q.H.*
(Prereq. ECE 1347 and ECE 1362)

This course may be a continuation of the project started in ECE 1390 or it may be a new project. Again, the student works closely with a faculty adviser.

ECE 1400 Special Topics 4 Q.H.
(Prereq. Permission of department)

Topics covered vary from term to term depending on the interests of the department and the students.

ECE 1401 Selected Topics In Electronics 4 Q.H.
(Prereq. ECE 1347)

This course concerns (1) the description and application of those electronic devices (thyristors, photodiodes, etc.) not covered in depth in the regular electronics sequence; (2) electronic subsystems (AFC, shift registers, etc.); (3) systems (navigation systems, telephone switching systems, etc.). Most of the presentations are made by students on topics of their choice, but there are also lectures by invited speakers as well as by the instructor.

ECE 1404 Theory and Technology of Semiconductor Devices I 4 Q.H.*
(Prereq. ME 1386)

This course comprises a closely coupled lecture and laboratory series. Topics covered include technology

and physics of the planar diffusion process, electronic properties of homogeneous semiconductors, inhomogeneities and junctions (Fermi potential diagrams, equilibrium at an abrupt discontinuity, and the behavior of a junction under applied bias), and the junction transistor.

ECE 1405 Theory and Technology of Semiconductor Devices II 4 Q.H.*
(Prereq. ECE 1404)

This course is a continuation of ECE 1404. Material covered includes introduction to unipolar transistor action, introduction to surface effects, the MOS-FET, and a discussion of noise problems encountered in semiconductor devices.

ECE 1408 Physical Electronics 4 Q.H.
(Prereq. ECE 1350, ECE 1362, CHM 1132)

Elements of solid-state theory including wave mechanics, crystalline and amorphous solids, statistical mechanics, and electron transport theory are developed to provide a proper background for the central objective of the course which is a thorough understanding of the principal building block of semiconductor devices—the junction diode. Other important elements such as ohmic contacts and Schottky barriers are explored as well as the several ways that these may be generated in individual and integrated form. Finally, as time permits, these elements are joined together to form BJT's and JFET's.

ECE 1418 Control System Theory 4 Q.H.
(Prereq. ECE 1347)

Control system concepts; goals and basic components. Review of time- and frequency-domain techniques. Classical control system theory; error analysis for different systems. Analysis of second- and third-order systems. Stability and relative stability using root locus and Nyquist diagrams. The Nichols chart. Compensation, application of computer technology to control systems analysis and design. State-variable description of dynamic systems. The state equations and the fundamental analog realization of the standard equations. Properties of the state-transition matrix. Optimal systems. Introduction to sampled data systems. The Z-transform as an analog to the Laplace transform.

ECE 1420 Control Systems 4 Q.H.
(Prereq. ECE 1217, ECE 1350)

Some of the topics included: classical control system theory, error analysis, stability and relative stability using root locus and Nyquist diagrams, the Nichols chart, compensation, application of computer technology to control system analysis and design. Also included as time permits: state variable description of dynamic systems, properties of the state-transition matrix, optimal systems, introduction to sampled data systems and the Z-transform as an analog to the Laplace transform.

ECE 1430 E.E. Power Laboratory A 1 Q.H.*

* Lab fee required.

ECE 1431 E.E. Power Laboratory I 1 Q.H.*

(Prereq. ECE 1333; Coreq. ECE 1471)

Single-phase circuits; balanced and unbalanced polyphase circuits; power measurement in polyphase circuits; transformer tests and equivalent circuits.

ECE 1434 E.E. Power Laboratory II 2 Q.H.*

(Prereq. ECE 1431, ECE 1371; Coreq. ECE 1472)

Experimental work with rotating machines and systems; steady-state and dynamic models of synchronous induction, and d-c machines; power-system load-flow studies and fault analyses.

ECE 1451 Communication Theory 4 Q.H.

(Prereq. ECE 1214)

Topics include signal analysis, including signal classes, Fourier methods, correlation functions, amplitude density, and power spectra; amplitude modulation, Hilbert transform applications, analytic signal, and complex envelope.

ECE 1452 Fundamentals of Communication Systems

(Prereq. ECE 1451)

4 Q.H.

Topics include frequency modulation, signal-to-noise ratios in AM and FM, multiplexing, sampling theory, pulse modulation systems, data transmission, signal space. Correlation detection, probability, random variables and random processes, information theory and coding.

ECE 1454 Communication Systems 4 Q.H.

(Prereq. ECE 1333, ECE 1217)

Signal representations and characterization; characterization of thermal noise in electronic circuits; amplitude modulation and demodulation; frequency and phase modulation and demodulation; pulse modulation; transmission of digital information.

ECE 1461 Wave Transmission and Reception

(Prereq. GE 1100 and ECE 1361)

4 Q.H.

Topics include analysis of radiation, transmission, and reception of electromagnetic and acoustic waves using graphical and digital computer techniques. Design of distributed systems, antennas, microphones, loudspeakers, and sonar transducers.

ECE 1462 Advanced Topics In Electromagnetic Field Theory 4 Q.H.

(Prereq. ECE 1362)

This course is a continuation of the required courses in field theory. Topics covered include microwave and waveguide structures, careful development of electromagnetic energy and force concepts, and an introduction to radiation and antenna theory.

ECE 1465 Wave Transmission and Reception

(Prereq. ECE 1363, ECE 1364)

4 Q.H.

This course discusses the transmission, radiation, and reception of electromagnetic waves at and above radio frequencies. Transmission-line theory is developed using Maxwell's equations and the circuit theory approximations are presented. Matched lines, tuning stubs, and loaded transmission lines are discussed,

together with the theory and applications of the Smith chart. The theory of guided waves in structures of rectangular and circular cross-section is presented, followed by the theory of the cavity resonator. The linear antenna is discussed and the radiation fields, directivity, and gain are defined. Other topics include the aperture antenna and the insulated antenna.

ECE 1471 Electrical Power Systems I 4 Q.H.

(Prereq. ECE 1333)

Basic introduction to electrical power systems, wherein three-phase circuits are analyzed under balanced steady-state operation. Topics include system elements, their characteristics and interaction; system modeling and network calculations.

ECE 1472 Electrical Power Systems II 4 Q.H.

(Prereq. ECE 1471)

A continuation of basic studies in electrical power systems. Topics include power system load-flow analysis; symmetrical components and fault calculations; system protection; economic operation of power systems; introduction to power system stability.

ECE 1481 Machine Language and Assembly**Language Programming****4 Q.H.**

(Prereq. ECE 1191)

This course focuses on study of the machine and assembly languages of a selected digital computer. Machine representation of numbers, characters, and instructions. Machine language programming; flow of control, relocatability, input/output instructions, addressing, and instruction modification. Symbolic assembly language; macros, literals, and pseudo-instructions. Several programming projects are an integral part of the course.

ECE 1482 Programming Systems 4 Q.H.

(Prereq. ECE 1481)

Continuation of ECE 1481. Assemblers, searching and sorting techniques, macro-processors loaders. High-level languages and an introduction to their compilation. Introduction to operating systems. Programming projects are an integral part of the course.

ECE 1484 Applied Discrete Analysis 4 Q.H.

(Prereq. MTH 1225)

The course offers an introduction to elementary number theory, modern algebra, combinatorial mathematics and discrete probability theory, including such topics as prime numbers, least common multiple, greatest common divisor, Euclid's algorithm, continued fractions, congruences, groups, rings, fields, Boolean algebra, combinations and permutations, generating functions, random variables, and Markov chains. The material in this course is widely applicable to the field of computer science.

ECE 1485 Microcomputer-Based Design 4 Q.H.

(Prereq. ECE 1192)

Course material includes characteristics of microprocessor applications; external and internal architecture of a specific microprocessor family; logic

* Lab fee required.

design of a simple microcomputer. Instruction set, timing cycles, I/O port selection and interrupt-handling; software design for keyboard monitor, breakpoint facility and multiplexed displays. Application design studies of real-time interfaces to electromechanical devices. Evolutionary trends in LSI microprocessors and memory systems. Integrated hardware and software design projects using laboratory microcomputers are an integral part of this course, which is designed primarily for electrical engineers.

ECE 1486 Numerical Methods and Computer Applications **4 Q.H.**
(Prereq. GE 1100 and ECE 1214)

The course focuses on presentation of numerical techniques used in solving scientific and engineering problems with the aid of digital computers. Topics

covered include modeling and simulating of deterministic and probabilistic systems, theory of interpolation, iteration methods, numerical solution of ordinary and partial differential equations, signal detection, and use libraries of scientific subroutines. Representative problems are chosen for solution on a digital computer.

ECE 1487 Digital Techniques **4 Q.H.**
(Prereq. ECE 1346 and ECE 1191)

This course attempts to supplement the topics covered in the electronics sequences and the introduction to digital computer courses. Topics may vary from year to year and may include details of semiconductor integrated gate circuits, flip flops, clocks, counters, memory units, A/D and D/A conversions, coding, and the fundamental techniques of digital data transmissions.

General Engineering

The course descriptions listed under General Engineering are intended to show the scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

GE 1100 Computer for Engineers **4 Q.H.***

Introduction to use of computers in the solution of engineering problems; FORTRAN programming language. A survey of the organization and function of an elementary digital computer; the use of flowcharts in developing program logic; establishing and manipulating tables, arrays, and matrices in memory, using subprograms and subroutine packages, and graphical output on an X-Y plotter. to meet specific design problems.

GE 1110 Engineering Graphics and Design **4 Q.H.***

Manual and computer methods for depiction of three-dimensional objects. The orthographic projection system using principal and auxiliary views is presented, as is reading and analysis of drawings, fundamentals of manufacturing processes, and dimensioning practice. There is an emphasis on engineering design of components and systems, and computer graphics using software packages. Students are required to write programs as an introduction to computer-aided design and manufacturing, and preliminary to design engineering.

Industrial Engineering

The course descriptions listed under Industrial Engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

IIS 1200 Work Design **4 Q.H.**

Topics include the engineering design process, principles of work physiology, workplace design from the standpoint of employee safety and effectiveness. Also covered are work measurement techniques, which include direct measurement, synthetic standards, and work sampling. A project in which principles of work design must be applied is an integral part of the course.

IIS 1300 Probabilistic Analysis for Engineers **4 Q.H.**
(Prereq. Integral & Differential Calculus)

Probability theory presented axiomatically, with emphasis on sample space representation of continuous and discrete random variables. Material will cover

standard distributions. Topics include expectation, transform techniques, and change of variable.

IIS 1310 Statistics I **4 Q.H.**
(Prereq. IIS 1300)

The course examines the definition of a statistic; distributions of random variables, including normal, T, chi-square, F, Poisson, binomial; estimation of parameters, point estimation by method of moments, maximum likelihood, Bayes estimates, interval estimation, and hypothesis testing.

IIS 1320 Statistics II **4 Q.H.**
(Prereq. IIS 1310)

Topics include linear regression, analysis of variance,

* Lab fee required.

reliability and decision theory from Bayes rule. Appropriate computer software is utilized to investigate example problems.

IIS 1330 Principles of Computation and Programming I **4 Q.H.**

(Prereq. FORTRAN)

The course covers review of algorithms, computers, and programming. Machine language programming (instruction, execution, and addressing techniques). Coding and representation of data. Program debugging and verification. Survey of machines, devices, and languages.

IIS 1340 Operations Research I **4 Q.H.**

(Prereq. MTH 1227)

Topics include deterministic models, including LP and duality; transportation and allocation; sensitivity and post-optimality analyses. Network analysis, including maximal flow, shortest route, and PERT.

IIS 1341 Operations Research II **4 Q.H.**

(Prereq. IIS 1310)

The course focuses on the stochastic models in OR; their analytical development and solution. Topics covered include queuing models, deterministic and stochastic inventory models, Markov chains, and sequencing. Dynamic programming and recursive functional expressions are also presented.

IIS 1345 Management Information Systems **4 Q.H.**

This course covers design and implementation of computer-based information systems. Topics include: the value of information, tools of system analysis and design, impact of computer-based information systems on organizations and society, rudimentary computer architecture, input devices, data organization and storage, system configuration, communications, and output/display devices.

IIS 1346 Basic Engineering Statistics **4 Q.H.**

(Not open to industrial engineering majors)

The course covers introduction to basic probability distributions, including the binomial and hypergeometric, exponential, Poisson, and normal; laboratory data analysis.

IIS 1350 Digital Simulation Techniques **4 Q.H.**

(Prereq. FORTRAN and IIS 1310)

The course covers model development, validation and experimentation for discrete event simulation models. Specific topics include problem formulation, data collection and analysis, random variable generation and statistical analysis of output. Experience with a major simulation language such as GPSS, SIMAN, or SIMSCRIPT is also acquired.

IIS 1356 Engineering Economy **4 Q.H.**

(Prereq. B.E.T. majors only)

Topics include the formulation of analytical techniques, i.e., rate of return, present worth, and annual cost. The application of these techniques to solve business and engineering problems involving design,

selection replacement, lease-buy decisions, and decisions between multiple alternatives. Sensitivity analysis and basic probability are introduced in cases where uncertainty exists. Brief survey of sources and costs of capital, debt-versus-equity financing, and leverage.

IIS 1360 Engineering Economy and Statistical Decisions Theory **4 Q.H.**

(Prereq. IIS 1300)

The objective of the course is to familiarize the student with the theory and techniques of economic evaluation of an investment project. Introductory steps in the analysis of investment proposals, time value of money, and cash flows; analysis of deterministic and stochastic cash flows in terms of present worth, annual cost, rate of return, and benefit/cost ratio. Decision tree for sequential decisions, criteria for decision making under uncertainty, utility theory, value of information, effect of accounting procedures and taxes on investment analysis.

IIS 1366 Engineering Economy **4 Q.H.**

(Not open to Industrial Engineering majors)

Topics include the formulation of analytical techniques, i.e., rate of return, present worth, and annual cost. The application of these techniques to solve business and engineering problems involving design, selection, replacement, lease-buy decisions, and decisions between multiple alternatives. Sensitivity analysis and basic probability are introduced in cases where uncertainty exists. Brief survey of sources and costs of capital, debt-versus-equity financing, and leverage.

IIS 1370 Industrial Cost Control **4 Q.H.**

Topics include fundamental concepts of accounting, with emphasis on using financial records to make engineering decisions. Study of financial statements of a firm. Contrast in usefulness of data from absorption costing vs. direct costing. Interpretation of variance accounts.

IIS 1400 Systems I **4 Q.H.**

(Prereq. MTH 1225)

Modeling, analysis, and control of linear feedback systems are examined through consideration of the following topics: differential equations as system models; transfer functions and block diagrams; system components and the method of analogies; accuracy and stability. Students will use appropriate computer software for applications.

IIS 1401 Design Project **4 Q.H.**

(Prereq. IIS 1300, IIS 1350, and IIS 1340)

The course examines analysis and design of major industrial engineering systems. Students are expected to undertake up to five projects drawn from line balancing, job shop scheduling, stochastic network analysis, reliability in design, complex queuing system design, sequencing, or other areas of student and faculty interest.

IIS 1405 Production and Inventory Control 4 Q.H.
(Prereq. IIS 1300)

Topics include basic inventory models and inventory management systems. Single-stage and multi-stage systems and their dynamics. Production control and aggregate planning. Mathematical and heuristic approaches to aggregate scheduling. Cost structure and decision-oriented analyses. Consideration of job shop scheduling and dispatching problems.

IIS 1415 Facilities Design 4 Q.H.
(Prereq. IIS 1340)

The course examines use of descriptive and optimizing models (e.g., simulation, queuing theory, and linear programming) to design facilities and associated materials-handling systems. Computer-assisted layout analysis techniques are applied to problems of real-world scope.

IIS 1425 Material Handling System Design 4 Q.H.
(Prereq. IIS 1340)

The course covers design and analysis of large material-handling systems. Topics include computer control of handling systems, integration with production and inspection, automated storage/retrieval systems, automatic identification systems, and systems acquisitions.

IIS 1435 Reliability and Quality Control 4 Q.H.
(Prereq. IIS 1310)

Applied probability and statistical inference techniques are utilized in reliability analysis and quality control. Both theory and application are discussed in relation to the total quality assurance program.

IIS 1455 Microcomputer Programming 4 Q.H.
(Prereq. GE 1100 or FORTRAN programming language)

A first course in microprocessor computing covers hex codes for assembly language. Basics of architecture model, programming model, and addressing modes. Instruction set for a typical machine. Programming techniques and details for a 6502 processor. Hands-on laboratory experimentation with typical interfacing problems. Case studies in the area of developing applications. Laboratory experimentation in staffed facility.

IIS 1465 Microprocessor Applications 4 Q.H.
(Prereq. IIS 1455, assembly language or permission of instructor)

System architecture of several microcomputers, including microprocessors, bus design, multichip

operation, and current trends in processors (8-, 16-, and 32-bit). Interfacing problems and hardware include: sensors, actuators, D/A and A/D converters, data transmission, and parallel/serial I/O. Real-time programming with case studies; network and distributed processing. Also included are development techniques and current state-of-the-art trends.

IIS 1470 Human Considerations in Engineering Design 4 Q.H.

An introductory human factors course with emphasis on the physiological and anthropometric bases of equipment and workplace design. Topics include: (1) an overview of the field of human factors; (2) work, fatigue, and endurance; (3) thermal regulation and heat stress; (4) biomechanics; (5) effects of aging on work capacity; and (6) body response to vibration.

IIS 1475 Human Factors 4 Q.H.

An introductory course with emphasis on human sensory/motor performance, information-processing capabilities, learning and skilled-task performance. Topics include: (1) an introduction to the experiment as a source of knowledge of human performance characteristics; (2) vision, visual performance, principles of display design; (3) audition, noise, and hearing damage, auditory signals; (4) information processing; (5) signal detection; (6) aging effects; and (7) system development.

IIS 1480 People in Organizations 4 Q.H.
(Prereq. Seniors only)

An overview course, using case studies and focusing on the influence of human behavioral factors on organizational performance. Students are provided with research evidence to aid in understanding and anticipating the response of organizational members to management practices. Topics include: (1) current theories of organization; (2) motivation; (3) group dynamics and the face-to-face work group; (4) leadership; (5) cognitive aspects of decision making; (6) work enrichment and job satisfaction; (7) job evaluation.

IIS 1800 Independent Study in Industrial Engineering 4 Q.H.

Independent study on advanced I.E. topics for students usually in the senior year and with high scholastic standing. Projects may be of an applied or theoretical nature; formal report submitted to student's project supervisor at the end of quarter.

Mechanical Engineering

The course descriptions listed under Mechanical Engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

ME 1311 Statics **4 Q.H.** (Prereq. PHY 1222)

Topics include the concept of vector representation of force and moment; equivalent force systems; centroids and centers of gravity, distributed forces; equations of equilibrium; free-body diagrams; applications to trusses, pin-connected frames and beams; and elementary concepts in friction.

ME 1312 Dynamics I **4 Q.H.** (Prereq. ME 1311)

Development of problem-solving ability in the fundamentals of dynamics. Topics include kinematics of particles, kinematics of rigid bodies (nonrotating frames), mass moments of inertia, kinetics of particles and rigid bodies (plane motion only) using force, mass, and acceleration.

ME 1313 Strength of Materials I **4 Q.H.** (Prereq. ME 1311)

Topics include concept of stress and strain; principal stresses; Mohr's circle, stress-strain diagrams; moment of inertia of areas; stress and deformation of simple members under axial and torsional loads, and stresses in symmetrical beam bending.

ME 1314 Strength of Materials II **4 Q.H.** (Prereq. ME 1313)

Topics include asymmetrical bending; analysis of determinate and indeterminate beams by various methods; and buckling of columns.

ME 1315 Dynamics II **4 Q.H.** (Prereq. ME 1312)

Continued development of problem-solving ability in dynamics. Topics include kinematics of rigid bodies using rotating frames, kinetics of particles and rigid bodies using work and energy, introduction of Lagrange's equations, kinetics of particles and rigid bodies using impulse and momentum, and simple gyroscopic motion.

ME 1320 Dynamics for Civil Engineers **4 Q.H.** (Prereq. CIV 1210)

Topics include kinematics, translating reference frames, mass moments of inertia, plane motion of rigid bodies, and instantaneous equations of motion.

ME 1321 Mechanics for Electrical Engineers **4 Q.H.** (Prereq. PHY 1222))

The course focuses on the study of kinematics and kinetics of rigid bodies, instantaneous equations of motion, work and energy, and impulse and momentum.

ME 1330 Mechanical Design **4 Q.H.** (Prereq. ME 1314)

The course focuses on engineering design of dynamically loaded machine elements. Topics include stress, strength and deformation analysis of machine elements; fracture and fatigue factors in design; and

design of basic machine parts (shafts, power screws, springs, bolted and welded joints).

ME 1331 Design Project **4 Q.H.** (Prereq. ME 1330)

The design project is the application of the engineering sciences to the design of a system component or process. Students will choose the particular design project with the approval of appropriate faculty. Design teams will be organized. Each project will include open-ended problems, development and use of design methodology, formulation of design problem statements and specifications, consideration of alternative solutions, feasibility considerations, and detailed system descriptions. It should include realistic constraints (such as economic factors, safety, reliability, maintenance, aesthetics, ethics, and social impact).

ME 1332 Thermal Design **4 Q.H.** (Prereq. ME 1345)

The purpose of the course is to develop the ability of the students to synthesize their understanding and knowledge of the basic concepts of thermodynamics, fluid mechanics, and heat transfer to meet the specifications of a design objective, which can be the thermal design of a system, component, and/or process. The course may include topics such as basic considerations in design, review of fundamentals of heat transfer and fluid mechanics, numerical methods in heat transfer, heat transfer analysis of heat exchangers, heat exchanger pressure drop analysis, analysis of hydraulic systems, modeling, systems simulation, and topics in optimization. One or more design problems will be assigned.

ME 1340 Thermodynamics I **4 Q.H.** (Prereq. MTH 1223)

Thermodynamics is the study of systems in which energy and its flow across systems boundaries are important. In this first course energy, heat, and work are defined and used in the First Law of Thermodynamics. Other thermodynamic properties and equations of state are introduced, with emphasis on tabular and graphical forms for simple compressible systems and on the ideal gas. Phases and phase transitions are briefly discussed, and energy analysis of both open and closed systems is examined. The Second Law of Thermodynamics and the property entropy are introduced, and their macro- and microscopic implications discussed. Emphasis, however, is placed on the macroscopic consequences of irreversibility and the limitation this places, through the Second Law, on the behavior of engineering systems. This course concentrates on basic concepts and their proper application to representative engineering systems.

ME 1341 Thermodynamics II**4 Q.H.**

(Prereq. ME 1340)

Course includes study of vapor power systems including the Rankine cycle and its modifications for use with both fossil and nuclear fuels, vapor refrigeration systems, and all-gas cycles including: a) the Brayton cycle and its modifications; b) the Otto cycle; c) the Diesel cycle; and d) supercharging and turbocharging. The course introduces concepts of availability and irreversibility and thermodynamics of nonreacting mixtures, with its application to air-water-vapor mixtures for air conditioning systems and cooling towers.

ME 1345 Heat Transfer I**4 Q.H.**

(Prereq. ME 1340, ME 1370, and MTH 1226)

The theories that describe conduction, convection, and thermal radiation heat transfer mechanisms are studied. Steady-state and transient conduction problems are discussed in rectangular, cylindrical, and spherical coordinate systems. Convective heat transfer mechanisms are studied, and the concept of the Nusselt-Reynolds Number correlation is introduced. Description of thermal radiation heat transfer between surfaces is discussed.

ME 1370 Fluid Mechanics I**4 Q.H.**

(Prereq. ME 1340, ME 1313, and MTH 1225)

The course offers an introduction to the concepts of fluid mechanics: fluid statics, including pressure distribution and forces on submerged surfaces; differential and integral formulations of conservation of mass, momentum, and energy with emphasis on control-volume applications; pipe flow with consideration of head loss, use of the Moody diagram and analysis of pipe networks.

ME 1380 Materials Science**5 Q.H.**

(Prereq. ME 1340 and CHM 1132)

An introduction to materials science for engineers, emphasizing the structure-property-function relation. Topics include crystallography, structure of solids, imperfections in crystals, phase equilibrium, phase transformations, diffusion, and physical properties. A laboratory is included in this course.

ME 1386 Materials Science**4 Q.H.**

(Prereq. ME 1340 and CHM 1132)

An introduction to materials science for engineers, emphasizing the structure-property-function relation. Topics include crystallography, structure of solids, imperfections in crystals, phase equilibrium, diffusion, and behavior of metals and semiconductors.

ME 1390 Measurements and Analysis**4 Q.H.***

(Prereq. ME 1340 and ME 1312)

Lecture subjects include design of experiments, instrumentation, measurements, data analysis, and report writing. Students apply the principles developed in class to a variety of laboratory experiments. Written reports are required.

ME 1395 Research Report**4 Q.H.**

(Prereq. Jr. Standing)

Students prepare a brief research paper on a technical subject of importance in mechanical engineering. All students must, before the end of the second week of the quarter of their enrollment, obtain written acceptance from a department faculty member for their research subject. Each student's work must show an ability to recognize the component parts of a subject and to organize them in a clear, logical, written presentation that demonstrates a command of grammar and style.

ME 1401 Advanced Strength and Applied Elasticity**4 Q.H.**

(Prereq. ME 1314)

Topics include analysis of curved beams, rings, and thick-walled pressure vessels; introduction to plane elasticity problems using rectangular and polar coordinate systems; and concepts of stress and strength.

ME 1402 Engineering Analysis**4 Q.H.**

(Prereq. ME 1314)

The course focuses on the numerical and experimental methods in stress analysis. Analytical techniques include an introduction to the finite element method. Experimental methods include, among others, strain gauge techniques and photoelasticity.

ME 1405 Mechanical Vibrations**4 Q.H.**

(Prereq. ME 1312)

The course focuses on the study of one-, two-, and multi-degrees of freedom systems using classical, energy, Laplace, mobility, matrix, and computer techniques. A laboratory is included in this course.

ME 1408 System Analysis and Control**4 Q.H.**

(Prereq. ME 1312)

This course provides students an opportunity to gain the theoretical background necessary to analyze and design simple linear control systems. System modeling, linear approximations and their limitations, transfer functions, and block diagrams; transient and frequency response; stability. Frequency domain, and root locus techniques are discussed.

ME 1410 Design for Space Applications**4 Q.H.**

(Prereq. ME 1312)

The course includes the study of Keplerian motion and transfer dynamics using Battin's solution. Optimization of transfer dynamics with respect to our solar system, and mass optimization, boost, and reentry dynamics are studied. Integrated design is used throughout the course.

ME 1430 Aspects of Forensic Design**4 Q.H.**

This course utilizes case studies in which students assume various investigative and court room roles, including (for both plaintiff and defendant) expert witnesses, lawyers, field and office engineers, and jury discussion. Students examine consumer protection accidents, the effect of changing standards

*Lab fee required.

and codes, classes of mechanical systems normally involved in consumer cases, the methodology of technical questioning, and writing and presenting expert reports.

ME 1435 Computer Aided Design 4 Q.H.
(Prereq. GE 1100 and ME 1314)

The concepts of computational and numerical geometry for design are introduced. The implementation of computer graphics in design and use of computer-aided design packages are included. Principles of numerical control techniques to design and manufacture are covered. A design project is required.

ME 1439 Engineering Design 4 Q.H.
(Prereq. ME 1314)

This course is intended for students who take only one course in design. Design projects vary from year to year, but in general expand and correlate previous courses in design of mechanical systems.

ME 1440 Introduction to Combustion 4 Q.H.
(Prereq. ME 1341 and CHM 1132)

An introduction to the science and technology of combustion. The fundamental principles of thermochemistry, chemical equilibrium, and rates of reaction are reviewed and related to combustion processes in heat engines. The principles of combustion waves are introduced, and the mechanisms of various physical and chemical processes in combustion are discussed.

ME 1441 Direct Energy Conversion 4 Q.H.
(Prereq. ME 1341 and CHM 1132)

This course is concerned with means for converting heat directly into electrical energy. The operating principles of such devices, principally magnetohydrodynamic power generators and fuel cells, are discussed. Other topics, such as energy storage, thermionic converters, and irreversible thermodynamics as a basis for a unified theory of energy conversion may be included.

ME 1470 Fluid Mechanics II 4 Q.H.
(Prereq. ME 1370)

Topics include velocity potential and stream functions; circulation and Kelvin's theorem; two-dimensional, steady irrotational incompressible flow; Karman-Pohlhausen method applied to two-dimensional boundary layers.

ME 1471 Fluid Machinery 4 Q.H.
(Prereq. ME 1370)

The course focuses on the general principles of turbomachinery: definitions of efficiency and a discussion of the requirements for similitude; machine selection to suit particular applications. Both liquid- and gas-handling machines are examined, and performance limits imposed by cavitation and choking are considered.

ME 1473 Gas Dynamics 4 Q.H.
(Prereq. ME 1370)

Course focuses on application of the principles of fluid mechanics to compressible flows. Wave propagation and the concepts of sound speed and Mach

number are discussed. The emphasis is on one-dimensional steady flows with an examination of the effects of area change, friction, and heat transfer, including a consideration of normal shock waves and the possibility of choking.

ME 1480 Mechanical Behavior of Materials 4 Q.H.
(Prereq. ME 1380 and ME 1313)

The study of the physical basis for the mechanical behavior of solid materials, including elasticity, plasticity, viscoelasticity, and fracture. Application is made to structural alloys and polymers.

ME 1483 Materials Processing 4 Q.H.
(Prereq. ME 1380)

The course offers a survey of the essential features and materials limitation of various methods for processing materials. Topics include heat treatment (ferrous and nonferrous alloys), casting, forming, joining, and machining.

ME 1490 Special Topics 4 Q.H.
(Permission of the department)

When offered, topics will vary depending on the previously expressed interests of a group of students and/or of the department.

ME 1495 Design and Analysis 4 Q.H.
(Prereq. ME 1331; cannot be taken simultaneously with ME 1496 or ME 1497)

A design project. Each student must, before the end of the second week of the quarter of his/her enrollment, obtain written approval for a proposed project from a department faculty member under whom the student will work. It is suggested that approval be secured before registration. A formal report must be submitted to the faculty supervisor at the end of the quarter.

ME 1496 Mechanical Engineering Project I 4 Q.H.
(Prereq. ME 1390; cannot be taken simultaneously with ME 1495 or ME 1497)

A project of an analytical or experimental nature. Each student must, before the end of the second week of the quarter of his/her enrollment, obtain written approval for a proposed project from a department faculty member under whom the student will work. It is suggested that approval be secured before registration. A formal report must be submitted to the faculty supervisor at the end of the quarter.

ME 1497 Mechanical Engineering Project II 4 Q.H.
(Prereq. ME 1496; cannot be taken simultaneously with ME 1495 or ME 1496)

If a project initiated under course ME 1496 is large enough in scope, a second project course may be taken with the approval of the faculty supervisor. A formal report must be submitted to the student's faculty supervisor at the end of the quarter.

ME 1540 Thermodynamics of Propulsion 4 Q.H.
(Prereq. ME 1341 and CHM 1132)

The course focuses on application of the principles of thermodynamics and fluid mechanics to understanding the behavior of propulsion devices. Emphasis is on air-breathing engines such as the aircraft

gas turbine and the ramjet. Various engine components, such as inlets, diffusers, compressors, combustors, turbines, and nozzles are discussed.

ME 1541 Nuclear Engineering I 4 Q.H.
(Prereq. ME 1341)

The course offers a study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay and nuclear reactions, with particular attention to fusion and fission. The course also examines health physics, nuclear instrumentation, and the production and uses of radioactive isotopes. A general comparison of thermal, fast, and breeder reactor types is made prior to a discussion of neutron interactions and their slowing down. The four-factor formula and diffusion equation are developed and applied to one-group theory for bare and reflected thermal reactors. Flux shaping as well as energy production and distribution within the core are discussed.

ME 1542 Nuclear Engineering II 4 Q.H.
(Prereq. ME 1541)

The course focuses on development of two-group theory for thermal reactors and consideration of the physics and safety of fast reactors. Effect of reactivity change, either intentional or accidental, as well as changes due to temperature, fission product build-up,

xenon build-up after shutdown, and fuel depletion are discussed. Reactor design considerations involving the interrelation of reactor physics, reactor engineering control, distribution of power, and fuel cycle management are considered.

ME 1545 Internal Combustion Engines 4 Q.H.
(Prereq. ME 1341)

The concepts and theory of operation of internal combustion engines are presented based upon the fundamental engineering sciences of thermodynamics, gas dynamics, heat transfer, and mechanics. The design and operating characteristics of conventional spark-ignition, compression-ignition, Wankel, and stratified charge spark-ignition engines are discussed. Performance analysis using Newhall-Starkman charts and computer programs are included.

ME 1580 Engineering Materials 4 Q.H.
(Prereq. ME 1380)

This course is concerned with the utilization of materials science in the application and selection of materials. Topics include reactions with environment, i.e., oxidation and corrosion, materials selection criteria, and materials engineering case studies dealing with materials selection and failure analysis.

Computer Science

COM 1100 Fundamentals of Computer Science 4 Q.H.

Introduction to computers and computer programming using the language PASCAL. Brief overview of text editing and system commands. Basic concepts of PASCAL: built-in data types, variables, assignment, expressions, and input/output. Tools for structured programming: flow control constructs, procedures and functions, user-defined data types using arrays, records, and strings. Techniques for input/output to terminals. Assignments will emphasize how to design programs systematically through the use of structured sub-units.

COM 1101 Algorithms and Data Structures I 4 Q.H.
(Prereq. COM 1100)

A continuation of the study of the programming language PASCAL and its applications. Recursion and stacks. Sorting techniques. Pointer data types. Singly and doubly linked lists. Introduction to trees. Sequential files.

COM 1102 Functional Programming and Applications 4 Q.H.
(Prereq. COM 1101)

This course introduces the fundamental concepts and applications of functional programming and their relationship to computer science. Basic ideas underlying symbolic information processing and the role of LISP in this context. Applications selected from: artificial intelligence, programming language design and

implementation, procedural and data abstraction, development of data-driven programs.

COM 1110 FORTAN Lab 1 Q.H.
(Prereq. COM 1100)

The course offers an introduction to the elements of FORTRAN programming, including I/O, subprogram linkage, and methods of structured programming in FORTRAN.

COM 1111 DCL Lab 1 Q.H.
(Prereq. COM 1100)

Course includes elements of command language; procedure files and parameter exchange; device handling for both tapes and disks; detailed coverage of the command language for the computer at the Academic Computer Center.

COM 1113 COBOL Lab 1 Q.H.
(Prereq. COM 1100)

An introduction to COBOL programming language for students who have already mastered another high level algorithmic language (such as PASCAL or FORTRAN). Topics include COBOL program structure, arithmetic and flow control, subroutines and procedures, report writing, searching, sorting.

COM 1114 C Lab 1 Q.H.
(Prereq. COM 1101)

The course covers elements of the C programming language as well as an introduction to the UNIX operating system.

COM 1130 Computer Organization and Programming I**4 Q.H.**

(Prereq. COM 1101)

An introduction to computer organization and programming at the assembly language level. Topics include arithmetic instructions, memory organization and data representation, addressing modes, flow control instructions, subroutines, procedures and linkage with higher level languages, run-time stack structure, implementation of recursion, floating point and bit instructions, terminal I/O using system services or higher level languages, use of the debugger.

COM 1131 Computer Organization and Programming II**4 Q.H.**

(Prereq. COM 1130)

Continuation of COM 1130. User-defined macros, system macros; character string instructions and parsing; decimal instructions, conversion, and editing; queue instructions; exception handlers; record management and file operations; low level queue I/O services; introduction to other system services.

COM 1201 Algorithms and Data Structures II**4 Q.H.**

(Prereq. COM 1101 and MTH 1409)

Introduction to complex data structures and corresponding algorithms for their manipulation. Lists, trees, sets, graphs and queues. Advanced sorting techniques, and an introduction to algorithm analysis. Height-balanced (AVL) trees. B-trees, including 2-3 trees. Hashing. As time permits, union and find operations on sets; depth-first search and shortest path algorithms on graphs; minimum cost spanning trees.

COM 1205 Software Design and Development**4 Q.H.**

(Prereq. COM 1201)

This course will present the latest ideas and techniques in software methodology and provide a means for students to apply these techniques. Students, working in groups, will be expected to design, implement, test, and document a large software project.

COM 1310 File Structures**4 Q.H.**

(Prereq. COM 1201 and COM 1131)

Access characteristics of secondary storage devices (tapes, disks and drums). External sorting and merging for heap files. Algorithms for common file operations on heap, hashed, ISAM, B-tree, dense indexes and TRIE file structures. Overflow techniques. Comparison of operations by block access count. Files with variable length records. As time permits, data compression techniques; structures for secondary access: multilist and inverted files; retrieval for partially specified records and ranges of records.

COM 1315 Data Base Management I**4 Q.H.**

(Prereq. COM 1310 and MTH 1409)

This course will emphasize the concepts and structures necessary to design and implement a data base application and survey some existing systems. Introduction to data base concepts. Data base modeling and entity relationship diagrams. Review of physical data organization. The relational model, QUEL,

and ISBL. Design of a relational model and normal forms. Data definition and data manipulation languages for network and hierarchical models. Comparison of models, some languages and implementations for these models.

COM 1316 Data Base Management II**4 Q.H.**

(Prereq. COM 1315)

This course will focus on data base systems that support relational model applications. Topics will include recovery, query optimization, integrity, security and concurrency, with examples based on INGRES and SYSTEM R. Additional topics such as data base machines may be covered at the discretion of the instructor. Students will implement a small relational DBMS.

COM 1330 Systems Programming**4 Q.H.**

(Prereq. COM 1111 or COM 1114 and COM 1131)

The purpose of this course is to familiarize the student with organization of the components of a computer operating system, their functions and mutual interactions. Assemblers, the structure of an object file and an executable file, linkers. Multiprogramming, multiprocessing, and time sharing. Memory management, device management, file management, libraries, I/O control, shared images.

COM 1335 Operating Systems I**4 Q.H.**

(Prereq. COM 1330)

In-depth study of algorithms and problems encountered in operating system design. Asynchronous concurrent processes, monitors, deadlocks, virtual performance measurement and evaluation, security.

COM 1336 Operating Systems II**4 Q.H.**

(Prereq. COM 1335)

Students will have the opportunity to gain hands-on experience working with a small operating system and writing programs to enhance its capabilities by implementing some of the algorithms studied in COM 1335.

COM 1350 Automata and Formal Languages

(Prereq. COM 1201 and MTH 1409)

4 Q.H.

Topics include finite-state machines and regular expressions; context-free grammars; parsing of deterministic context-free languages; pushdown automata; pumping theorems for regular and context-free languages; Turing machines, Church's thesis and the halting problem.

COM 1355 Compiler Design**4 Q.H.**

(Prereq. COM 1131 and COM 1350)

This is a course on the front end of a compiler. Quick review of FSA and language terminology. Topics include lexical analysis, recursive descent parsing, look-ahead parsing, precedence parsing, syntax-directed translation and syntactic error recovery. Particular emphasis will be on LALR (1) parsing as it is used in compiler-compilers. Possible projects include writing a recursive descent parser for a small language and/or practice using a compiler-compiler.

COM 1356 Compiler Design II**4 Q.H.**

(Prereq. COM 1355)

This is a course on the middle phase and back end of a compiler. It includes static issues such as type checking, symbol table organization, scope rules, and aggregate types such as arrays and records. Run-time structure, code optimization techniques and error recovery. Students will construct a compiler using a compiler-compiler for the front end and will write their own back end.

COM 1358 Analysis of Programming Languages**4 Q.H.**

(Prereq. COM 1102, COM 1110, COM 1355 and COM 1201)

Topics include run-time behavior of programming languages; interpreters, static and dynamic scoping, parameter passing mechanism, implementation of functions and recursion; and features of current languages and their implementation.

COM 1370 Computer Graphics**4 Q.H.**

(Prereq. COM 1201 and MTH 1301)

The course focuses on characteristics and programming of graphics output devices. Basics point and line drawing, two-dimensional displays, clipping and windowing. Pictures: data structures and display file organization. Interaction: graphical input and external events-operating system considerations. Some three-dimensional drawing will be included as time permits.

COM 1390 Analysis of Algorithms**4 Q.H.**

(Prereq. COM 1201, MTH 1125, MTH 1409 and MTH 1301)

This course introduces the basic principles and techniques of analyzing algorithms. Topics include algorithms on sorting, searching, graphs, and digraphs (such as minimal spanning tree, shortest path, depth-first search, components of a graph); methods involving string matching, polynomials and matrices. If time permits, fast Fourier transform and the concept of N P-complete problems.

COM 1410 Artificial Intelligence**4 Q.H.**

(Prereq. COM 1102, COM 1201 and MTH 1409)

This course focuses on analysis of current computer algorithms dealing with problems such as theorem proving, chess playing, general problem solvers, robotics, symbolic computation, perceptions, self-reproducing automated parallel machines.

COM 1420 Principles and Methods in Interactive Systems Design**4 Q.H.**

Introduction to principles of computer-human interface (software) design, and methodologies of implementation, evaluation, and research in computer-human interaction. Topics include user psychology, dialog styles (menu interfaces, command languages, icons, windows etc.), screen layout and design, input and output devices (mouse, touchscreen, keyboard, voice technology, etc.), error handling/reporting and system response time, user documentation, and "intelligent" interfaces. Also techniques for implementing software-human interfaces, and methodologies for testing and assessing the "usability" of interactive systems.

COM 1600 Computer Science Project**4 Q.H.**

(Prereq. COM 1102, COM 1110, COM 1355, and COM 1201)

This course will present the latest ideas and techniques in software methodology and provide a means for students to apply these techniques. Students, working in groups, will be expected to design, implement, test, and document a large software project.

COM 1620 Computer Science Seminar**4 Q.H.**

(Prereq. Computer science seniors only)

(This course superseded by COM 1621 as of academic year 1988-89.)

This course acts as a "capstone" course for computer science majors. Meetings are held once or twice per week and a current topic or problem in computer science is presented by an expert in the subject matter. Students are assigned additional questions and/or problems to research in the topic area as an aid to their developing a deeper appreciation and understanding of various aspects of computer science.

COM 1800 Directed Study in Computer Science**4 Q.H.**

(Prereq. Permission of the instructor. May be repeated for credit.)

Programs of directed study, held one or more quarters, are available for highly motivated students who wish to explore special topics in computer science in depth. Directed study can be used as an opportunity to examine familiar material in fresh ways or to explore new material that is not offered in formal courses. It is hoped that directed study programs will provide students strong in computer science and related sciences a chance to develop the art and skill needed to work independently and creatively in computer science.

Engineering Technology

Chemical Engineering Technology

CHT 1381 Nuclear Technology 4 Q.H.*
(Prereq. MTH 1195 and PHY 1196)

Atomic and nuclear structure, discovery and nature of radioactivity—clear reactions and energy-induced nuclear transformations, neutron properties, applications of radio nuclides. Radiological safety nuclear instrumentation for particle detection, monitoring, and experimentation. The fission process and its applications; nuclear reactors—their classification, design, and application, nuclear fuel processing, radioactive waste disposal. Supplementary laboratory experiments.

Computer Technology

CT 1105 Introduction to Programming 4 Q.H.

A high-level structured language (PASCAL) will be taught and used as a vehicle for implementing program. Students will write and run programs using Northeastern's computer. Topics: using the Northeastern University computer, flow charting program construction, computations involving maxima and minima, arrays, simple recursion, subroutines.

CT 1310 FORTRAN 4 Q.H.
(Prereq. CT 1105 or equiv.)

This important scientific language will be taught with engineering applications. Students will write and run FORTRAN programs using the Northeastern University computer. Topics: arithmetic replacement, input, output, control and specification statements, looping, arrays, functions and subroutines.

CT 1311 Programming with "C" Language 4 Q.H.
(Prereq. CT 1105 or CT 4105)

Students will write programs in "C," a general purpose programming language useable for operating systems or numerical, text-processing and data-base programs. A basic knowledge of programming fundamentals is assumed. Topics will cover basic data types, operators and expressions, control flow (if-else, while, etc.), functions and program structure, external variables, scope rules, pointers, address arithmetic, structure and union, and the C I/O Library.

CT 1320 COBOL 4 Q.H.
(Prereq. CT 1105 or equiv.)

This important business language will be taught with general applications. Student will write and run COBOL programs using the Northeastern University computer. Topics: divisions names rules, picture clauses, verbs, input/output instructions, levels, working storage, arithmetic, corresponding accept, display, compute, copy, update logic, table logic, redefines, search, inline and COBOL sorts.

CT 1330 Nonnumerical Algorithms 4 Q.H.
(Prereq. CT 1105)

Data, structures, storage, manipulation and retrieval

methods. Students will write and run data manipulation programs using Northeastern's computer. Topics: stacks, queues, lists, trees, heaps, sets, graphs, searching, sorting, key processing, relational models.

CT 1335 Numerical Algorithms 4 Q.H.
(Prereq. CT 1310)

Computer methods for solving mathematical problems. Students will write and run application programs using the Northeastern University computer. Topics: deterministic vs. stochastic methods, random-number generators, iterative vs. noniterative solutions, maxima and minima in two and three variables, curve fitting in two and three variables, integrals, trapezoidal and Simpson's rules, slopes, difference equations in two and three variables, vector and matrix algebra, simultaneous linear equations, nonlinear equations, permutations, and combinations.

CT 1340 Modern Programming Techniques 4 Q.H.
(Prereq. CT 1105)

Structured methods for developing complex computer programs. Students will develop and write sections of complex programs. Students will run programs on the Northeastern computer. Topics: top down design, hierarchy diagrams, HIPO charts, composite design, structured analysis, team programming.

CT 1341 Basic Computer Organization 4 Q.H.
(Prereq. CT 1105)

Fundamental aspects of basic computer components. Topics: the functions and general operating characteristics of CPU's, primary/secondary and mass memory, controllers, printers, card readers, terminals. What an operating system does, scheduling, monitoring, spooling, paging, system programs, virtual memory, multiprogramming, multiprocessing.

CT 1342 Advanced Computer Organization 4 Q.H.
(Prereq. CT 1105)

The operating and performance characteristics of complex and special purpose components. Topics: how an operating system works, memory hierarchies, fiber optics, bubble memory, mass storage, computer networks, distributed processing, data flow, cache memory, associative memory, special purpose/parallel processors, system performance measures.

CT 1345 Assembly Language 4 Q.H.
(Prereq. CT 1105)

A typical microprocessor assembly language will be taught. Students will write and run homework problems using a microprocessor simulator package implemented on the Northeastern University computer. Topics: binary arithmetic, instruction sets, addressing modes, code conversion, subroutines, macros, I/O.

* Lab fee required.

CT 1355 Micro Peripheral Hardware 4 Q.H.
(Prereq. CT 1375)

The elements of microprocessor peripheral hardware and its interfacing. Students will configure microprocessor systems using block diagrams showing relevant handshaking signals. Topics: serial and parallel I/O devices, DMA and interrupt control devices, bus arbitration, memory management units, counter timers as extensions of basic CPU functions.

CT 1356 Complex Peripheral Hardware 4 Q.H.
(Prereq. CT 1355)

The interfacing and implementation of special purpose hardware. Students will configure systems, using block diagrams showing relevant handshaking signals. Topics: virtual memory, rotating media, printers, terminals, bus extension concepts, co-processors.

CT 1360 Industry Software 4 Q.H.
(Prereq. CT 1342, CT 1310)

A survey of current commercial software packages and methods. Students will exercise commercial packages implemented on Northeastern's computer where applicable. Topics: specific packages and methods which vary from year to year to maintain currency. They will be drawn from the following general categories: data base management, scientific and statistical analysis, security and privacy, software assurance, and documentation.

CT 1365 Industry Hardware 4 Q.H.
(Prereq. CT 1356)

A survey of the latest industrial developments and trends in computer hardware. Conducted as a seminar.

CT 1368 Semiconductor Logic 4 Q.H.
(Prereq. EET 1152)

A detailed analysis of the bipolar and MOS transistors in saturated and cutoff condition and implementation of these concepts to form basic logic and decision-making circuits. Students will convert logical expressions into hardware configuration representations. Topics: Ebers-Moll modeling, PMOS, NMOS, CMOS construction, logic families.

CT 1369 Computer Logic 4 Q.H.
(Prereq. CT 1368)

An introduction to the hardware building blocks of general computers. Students will specify configurations of lower level components to achieve composite logical functions, e.g., construct a register from NAND gates. Topics: gates, flipflops, registers, decoders, ALUs, memory arrays.

CT 1374 Introduction to CPU Hardware 4 Q.H.
(Prereq. CT 1345 or equiv.)

The internal operation of a microprocessor CPU. A black box approach is used. Students purchase and keep individual single board computers for doing homework and simulation. Topics: registers and timing control, programmable gate arrays, array processors as CPU models.

CT 1375 CPU Hardware Architecture 4 Q.H.
(Prereq. CT 1374)

The performance characteristics of commercially

available CPU's. Students will write code for 4-bit through 32-bit processors. Topics: the characteristics of 4004, 4008, 8080, Z80, Z800, 8086, 1802 F8 and 6800 processors, and how to use one processor in place of another. *Note:* the list of processors examined may vary from year to year to maintain currency.

CT 1380 Data Communication Methods 4 Q.H.
(Prereq. CT 1310)

Functional and operational aspects of data communication devices and software. A black box approach will be used. Topics: modems, control units, multiplexers, concentrators, front end processors, synchronous/asynchronous/half duplex/full duplex codes and procedures, Bisynch/SDLE/HDLC, BYTE and BIT protocols, protocols, error checking, point to point/multi-drop/STAR/MESH/CLUSTER networks.

CT 1381 Operating Systems 4 Q.H.
(Prereq. CT 1351)

The basic principles of operating system implementation. Students write and run programs to exercise elements of the University's operating system when applicable. Topics: resource, memory, processor and device management commands and strategies, I/O programming, swapping, overlays, jobs and process scheduling, and other operating systems.

CT 1382 Computer Graphics Programming 4 Q.H.
(Prereq. CT 1310)

Students are introduced to generalized techniques for the computer plotting of 2- and 3-dimensional shapes. Students write and run programs using the University's computer and digital plotter. Topics: 2D transforms, 3D to 2D transforms, 3D transforms, surface representation, shading, character, curve fitting, graphic data structures.

CT 1383 Data Bases 4 Q.H.
(Prereq. CT 1330)

An introduction to data-base organization structure and management. Students write and run programs exemplifying techniques developed in class on the University's computer. Topics: access methods, attributes, indices, keys, querying, searching and matching, file sets, normal forms, random access.

CT 1384 Large System Assembly Languages 4 Q.H.
(Prereq. CT 1345)

Typical large computer system assembly languages. Students will write and run illustrative programs on the University's computer. Topics: edit and translate instructions, macro writing, program sectioning, linking, data representation, addressing, instruction formats in BAL and VAX-11 assembler languages.

CT 1385 Introduction to Simulation Programming 4 Q.H.
(Prereq. CT 1335)

Computer methods for solving simulated phenomena. Students will write and run programs implementing simulations specified by instructor. Students will not be responsible for the validity or evaluation of models except in simple cases. Topics: simple queues; multiserver queues; priorities, including first in first

out, last in last out, and time aging of data; simple frequency distributions; use of SIMULA, GPSS, and standard Subroutine Library Routines.

CT 1386 Development System Hardware 4 Q.H.
(Prereq. CT 1375)

A study of the principal hardware capabilities and current trends in micro computer level system. Included are both single users and network-oriented system.

CT 1387 Bit Slice Micro Computers 4 Q.H.
(Prereq. CT 1355)

The epitome of hardware flexibility is represented by the bit slice CPU. Demonstrates the basic design ground rules common to this style of hardware design.

CT 1388 Micro Controllers 4 Q.H.
(Prereq. CT 1374)

The commercial segment of micro computers has been satisfied by a variety of single-chip 4-bit micro controllers. A detailed contrast/comparison will be done on several of these devices, including the IMS-1000, S2000, COPS, and PPS-4.

CT 1389 Single-Chip Microprocessors 4 Q.H.
(Prereq. CT 1374)

When small 6-bit intelligent devices are rewired in high volume, the single-chip microprocessor in the form of the 3870, 8084 Z8, and others comes into play. An understanding of the hardware limitations of single-chip system presents the basis for this subject material.

CT 1390 Special Problems in Computer Technology 4 Q.H.

Theoretical or experimental work under individual faculty supervision.

Electrical Engineering Technology

EET 1151 Circuit Analysis I 4 Q.H.
(Prereq. MTH 1193 and PHY 1193)

Topics include Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations—all with respect to direct currents; energy storage, singularity functions, response of R, L, and C elements to singularities.

EET 1152 Circuit Analysis II 4 Q.H.
(Prereq. EET 1151)

Topics include complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks.

EET 1310 Electrical Measurements 4 Q.H.
(Prereq. EET 1353)

The course covers standards of measurements; dimensional analysis; errors and measurement of dispersed data; discrete and continuous variables, binomial distribution, normal distribution; guaranteed error; methods of resistance measurements; digital voltmeters and analog-to-digital conversion; voltage references; potentiometers and a.c. bridges.

EET 1311 Electronics I 4 Q.H.
(Prereq. EET 1152)

Topics include semiconductor diodes and applications, transistor-biasing techniques, graphical analysis of basic amplifiers, d.c. and a.c. load lines.

EET 1312 Electronics II 4 Q.H.
(Prereq. EET 1311)

Topics include small-signal, low-frequency transistor models; gains and impedances at midband; frequency effects in transistor circuits; multistage circuits; transistors used as current sources.

EET 1313 Electronics III 4 Q.H.
(Prereq. EET 1312)

The course covers review of Bode plots, transistor circuits at low and high frequencies, feedback operational amplifiers, differential amplifiers, applications.

EET 1314 Pulse & Digital I 4 Q.H.
(Prereq. EET 1311)

The course covers switching characteristics of semiconductor devices; wave generation and shaping, using combinations of passive and integrated circuit components; comparators, hysteresis, and the dual ramp analog to digital converter-voltmeter circuits, voltage-to frequency conversion.

EET 1315 Pulse & Digital II 4 Q.H.
(Prereq. EET 1314)

Topics include digital operations; logic statements and theorems; minimization of logic functions; logic gates and the characteristics of the integrated logic families; flip-flops, counters and registers; introduction to sequential circuit design; sample and hold circuits; analog-to-digital conversion.

EET 1317 Principles of Communication Systems I 4 Q.H.
(Prereq. EET 1313)

Topics include signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers, including wideband; transistor power amplifiers AF and RF; oscillators; signal sources and applications.

EET 1318 Principles of Communication Systems II 4 Q.H.
(Prereq. EET 1317)

The course covers basic theory of amplitude, frequency, phase and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; modems.

EET 1319 Principles of Communication Systems III
4 Q.H.

(Prereq. EET 1318)

The course covers fundamentals of digital communications; sampling requirements; analog-to-digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, PWM; time and frequency division multiplexing; data decoding; selected examples from telemetry and computer links.

EET 1320 Electricity and Electronics I
4 Q.H.

(Prereq. MTH 1193 and PHY 1193)

The course covers introduction to circuit analysis, resistive networks, periodic excitation function, steady-state ac circuits; the physical foundations of electronics and the physical operation of electronic devices.

EET 1321 Electricity and Electronics II
4 Q.H.

(Prereq. EET 1320)

The course covers single-stage electronic circuits, magnetic circuits and transformers, electro-mechanical energy conversion, dc machines, ac machines.

EET 1323 Electronic Laboratory
2 Q.H.

(Prereq. EET 1312 or concurrently)

The course covers experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semi-conductor diodes; power supplies, including the regulated type; silicon-controlled rectifiers, resistance-coupled amplifiers using transistors, including feedback methods.

EET 1324 Circuits Laboratory I
2 Q.H.

(Prereq. EET 1151)

The course covers experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses, oscilloscope theory and applications.

EET 1325 Circuits Laboratory II
2 Q.H.

(Prereq. EET 1324)

The course offers further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, nonlinear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis. Fourier analysis and synthesis.

EET 1327 Advanced Electronics Laboratory I
2 Q.H.

(Prereq. EET 1323)

The course covers experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers.

EET 1328 Advanced Electronics Laboratory II
2 Q.H.

(Prereq. EET 1327)

The course covers experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion.

EET 1329 Advanced Electronics Laboratory III
2 Q.H.

(Prereq. EET 1328)

Topics include spectral studies of FM and PM waves, amplitude limiters, the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments and digital experiments.

EET 1330 Energy Conversion
4 Q.H.

(Prereq. EET 1152 and MTH 1195)

Topics include generalized theory of rotating energy conversion devices; steady-state operation of the multiply-excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines.

EET 1337 Distributed Systems
4 Q.H.

(Prereq. MTH 1195 and PHY 1193)

Topics include radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line.

EET 1353 Circuits Analysis III
4 Q.H.

(Prereq. EET 1152)

The course covers application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time-domain transient analysis; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts.

EET 1354 Circuits Analysis IV
4 Q.H.

(Prereq. EET 1353)

Topics include signal analysis in the frequency domain; Fourier series: Fourier and Laplace transform methods; a varied selection of circuit problems using Laplace transforms and related theorems.

EET 1360 Engineering Analysis I
4 Q.H.

(Prereq. MTH 1195, EET 1152)

The course covers linear algebra and its application to circuit equations; solution of linear differential equations, including an introduction to Laplace transforms.

EET 1362 Basic Power Systems I 4 Q.H.
(Prereq. EET 1354)

Topics include consideration of power transmission lines; line constants; current voltage and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices.

EET 1363 Basic Power Systems II 4 Q.H.
(Prereq. EET 1362)

Topics include consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application.

EET 1364 Basic Power Systems III 4 Q.H.
(Prereq. EET 1363)

Topics include computer applications to power systems with emphasis on load-flow studies, basic ideas of systems planning, short-circuit studies, and system stability.

EET 1370 Digital Computers 4 Q.H.
(Prereq. EET 1311)

Introduction to digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean algebra applications to computer design.

EET 1371 Digital Computers II 4 Q.H.
(Prereq. EET 1370)

Examination of microprocessor architecture and organization. Study of the machine language and assembly coding of an industry-accepted microprocessor. A suitable topic from the current literature will be analyzed. Assembly language coding problems will be assigned.

EET 1377 Control Engineering I 4 Q.H.
(Prereq. EET 1354 and MTH 1195)

Topics include analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function.

EET 1378 Control Engineering II 4 Q.H.
(Prereq. EET 1377)

Topics include system stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation.

EET 1390 Optical Instrumentation 4 Q.H.
(Prereq. MTH 1192 and PHY 1193)

The course focuses on telescopes, microscopes, etc., as optical system components. Includes magnification, aberrations, resolution criteria, photometry. Compatibility of system components and optimization of systems. The basic nonimage-forming systems used for analysis control and metrology.

EET 1399 Special Problems in Electrical Engineering Technology 4 Q.H.
(Prereq. Consent of department chairperson)

The course offers theoretical or experimental work under individual faculty supervision.

General Engineering Technology

GET 1100 Computer Programming for Engineering Technology 4 Q.H.

(Prereq.—or concurrently—MTH 1192)

Introduction to the use of computers in the solution of problems using FORTRAN on interactive terminals. Students write and run programs to compute sequences, averages, etc. Other capabilities of the FORTRAN language, including DO loops, subscripted variables and alphanumeric manipulation matrix algebra, and numerical methods.

GET 1170 Engineering Graphics I 4 Q.H.

The study of concepts and the development of skills to present and to analyze objects and systems used in design through the principles of graphical geometric constructions, orthographic projections (multi-view, two-dimensional drawings), and the design process. Axonometric drawing.

GET 1171 Engineering Graphics II 4 Q.H.

(Prereq. GET 1170)

Continuation of the study of concepts and the development of skills to present and to analyze objects and systems used in design including dimensioning, sectioning, threads, fasteners, assembly, and detail drawings as well as the design process. A design project.

GET 1315 PASCAL (A Second Language) 4 Q.H.

(Prereq. GET 1100 or equiv.)

An introductory course in programming computers using the PASCAL language. Students will write and run programs using the University's computer facilities. This course may not be used as a technical elective in Computer Technology Program.

GET 1364 Kinematics 4 Q.H.

(Prereq. GET 1171, GET 1100, PHY 1191)

Study of four-bar linkages, sliders, etc., using orthogonal components of vectors, instantaneous centers, equivalent linkages, effective cranks, etc., emphasizing graphical solutions, including an introduction to the computer to enhance these concepts. Reverted and epicyclic gear trains are analyzed, as are cam displacement, velocity, and acceleration diagrams.

Mechanical Engineering Technology

The course descriptions listed under Mechanical Engineering Technology are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

MET 1301 Mechanics A 4 Q.H.

(Prereq. MTH 1193; or MTH 4120; PHY 1191 or PHY 4117)

Topics include forces, moments, couples, statics of particles and rigid bodies in two and three dimensions. Distributed forces: external and internal. First moments and centroids. Analysis of structures: trusses, frames, and machines.

MET 1302 Mechanics B 4 Q.H.

(Prereq. MET 1301 or MET 4301)

Topics include friction, second moments, and virtual work. Kinematics of particles; rectilinear and curvilinear motion of dynamic particles. Force, mass, and acceleration; work and energy.

MET 1303 Mechanics C 4 Q.H.

(Prereq. MET 1302 or MET 4302)

Topics include impulse and momentum of particles. Kinematics and dynamics of rigid bodies: force, mass, and acceleration. Dynamics of rigid bodies: work and energy, impulse and momentum. Introduction to mechanical vibration.

MET 1314 Stress Analysis A 4 Q.H.

(Prereq. MET 1301 or MET 4301)

Topics include axially loaded members; stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members; thin-walled pressure vessels; centric loading of bolted and welded connection; shear and moment in beams; eccentrically loaded connections; flexural and transverse shearing stresses in beams.

MET 1315 Stress Analysis B 4 Q.H.

(Prereq. MET 1314 or MET 4314)

Topics include determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods; theorem of three moments. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined and principle stresses; Mohr's circle; theories of failure.

MET 1319 Mechanics 4 Q.H.

(Prereq. MTH 1193 and PHY 1191)

Kinematics of particles: rectilinear and curvilinear motion of dynamic particles. Force, mass, and acceleration; work and energy. Impulse and momentum of particles. Kinematics and dynamics of rigid bodies: force, mass, and acceleration. Dynamics of rigid bodies: work and energy, impulse and momentum.

MET 1330 Mechanical Design A 4 Q.H.

(Prereq. MET 1315 or MET 4315; MET 1380 or MET 4380)

The course covers introduction to mechanical design, the design process, design factors, creativity, optimization, human factors, value engineering. These principles are discussed and developed through simple design projects. Principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads.

MET 1331 Mechanical Design B 4 Q.H.

(Prereq. MET 1330 or MET 4330)

Topics include stresses; deformation and design of fasteners, screws, joints, springs, and bearings; lubrication and journal bearings. Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes.

MET 1340 Thermodynamics A 4 Q.H.

(Prereq. PHY 1192 or PHY 4118)

Topics include general theory of heat and matter, laws of thermodynamics, energy-transformation principles; availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles.

MET 1341 Thermodynamics B 4 Q.H.

(Prereq. MET 1340 or MET 4340)

The course covers theory of vapor engines and analysis of actual engine types using gas and vapor compression; internal combustion engines; theory of gas and vapor flow through orifices and nozzles; principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems.

MET 1342 Refrigeration and Air Conditioning

(Prereq. MET 1341 or MET 4341)

4 Q.H.
The course focuses on air conditioning principles, including psychometrics and heat pumps. Course covers calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices; principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems.

MET 1343 Heat Transfer 4 Q.H.

(Prereq. MET 1341 or MET 4341)

Topics include the primary modes of heat transfer; thermal conductivity; thermal conductance/resistance concept; thermal-electrical analogy; combined heat-transfer mechanisms; basic equations of conduction; analytical solutions of various steady-state conduction problems. The course also covers dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; black-body radiation; Kirchhoff's law; emissivity and absorptivity; radiation between simple bodies; numerical methods; log mean temperature differences; overall heat-transfer coefficients; heat exchanger effectiveness; tubular exchanger design; regenerative and evaporative heat exchangers, and heat-transfer engineering problems.

MET 1370 Fluid Mechanics A 4 Q.H.

(Prereq. MET 1302 or MET 4302)

Topics include hydrostatics, principles governing fluids at rest, pressure measurement; hydrostatic forces on submerged areas and objects; simple dams, fluids in moving vessels; hoop tension fluid flow in pipes under pressure; fluid energy, power, and friction loss; Bernoulli's Theorem, flow measurement.

MET 1371 Fluid Mechanics B 4 Q.H.

(Prereq. MET 1370 or MET 4370)

The course covers pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; nonuniform flow; accelerated and retarded flow; hydraulic jump and waves.

MET 1380 Materials A**4 Q.H.**

Lectures on fundamental metallic structures; general metallurgical information covering theoretical aspects of properties, testing, and failure of metals. Supplemented by visual aids. Lectures on alloying and hardening of metals, refinement of metals, equilibrium diagrams, characteristics of engineering metals, principles of metal fabrication.

MET 1390 Measurement & Analysis Lab**2 Q.H.**

(Prereq. MET 1314 or MET 4314; GET 1100 or GET 4100; MTH 1195 or MTH 4122; PHY 1193 or PHY 4119)

The course includes experimental procedures for the collection and analysis of data by graphics and numerical methods including computer applications, report writing that draws conclusions relative to accuracy, precision, true values, and measured values as they relate to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements.

MET 1391 Technology Lab A**2 Q.H.**

(Prereq. MET 1390 or MET 4390; MET 1315 or MET 4315; MET 1380 or MET 4380; or concurrently)

The course includes experimental procedures to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by normal and abnormal environmental conditions; also as they are affected by homogeneity, non-homogeneity, isotropy, and non-isotropy.

MET 1392 Technology Lab B**2 Q.H.**

(Prereq. MET 1390 or MET 4390, MET 1370 or MET 4370; or concurrently)

The course includes experimental procedures to determine the physical properties of incompressible fluids and to measure the flow rates and velocities utilizing pilot tubes, orifice plates, venturii and weirs flow meters, U-tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits, conduits under pressure, pipe networks, turbines and pumps.

MET 1393 Technology Lab C**2 Q.H.**

(Prereq. MET 1390 or MET 4390; MET 1341 or MET 4341; or concurrently)

The course covers basic thermodynamic relations; experimental procedures to examine the flow of compressible fluids and steam and the energy conversion of a fuel into a working substance and the related heat-transfer mechanisms. Operating characteristics of thermal generators, engines, and compressors.

MET 1394 Technology Lab D**2 Q.H.**

(Prereq. MET 1393 or MET 4393; MET 1341 or MET 4341; MET 1343 or MET 4343; or concurrently)

The course includes experimental procedures to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, friction horsepower, mean effective pressure, fuel consumption, torque, ignition timing,

manifold pressure, and compression ratios and internal engines as energy conversion systems; energy conversion of fuels.

MET 1395 Technology Lab E**2 Q.H.**

(Prereq. MET 1390 or MET 4390; MET 1342 or MET 4342; MET 1343 or MET 4343)

The course includes experimental, analytical, and design projects to examine refrigeration, air conditioning, and heating-pump cycles.

MET 1396 Machine Shop**4 Q.H.**

Introduction to study of machines for metal processing, cutting tools, and fluids; machinability, automatic machinery.

MET 1414 Mechanical Vibrations**4 Q.H.**

(Prereq. MET 1303, MET 4303)

Elements of vibrating systems; one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods), natural frequencies; damped free and forced vibration; impedance and mobility; systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber.

MET 1415 Experimental Stress Analysis**4 Q.H.**

(Prereq. MET 1315 or MET 4315)

Theory and experimentation showing the application of extensometers and electrical strain gauges as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice on photoelastic methods as applied to classical model analysis and modern coating analysis.

MET 1416 Stress Analysis C**4 Q.H.**

(Prereq. MET 1315 or MET 4315)

Topics include curved beam, asymmetrical bending of beams, shear-center and shear stresses on thin sections, composite beams; columns energy absorption and resilience, inertial stresses, impact loading, deflection of beams by energy methods.

MET 1444 Power Generation**4 Q.H.**

(Prereq. MET 1341 or MET 4341)

Topics include basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, etc., on cycle performance; Rankine regenerative cycles, effects of steam temperature, pressure, number of feedwater heaters, etc., upon performance; steam generation equipment: boilers reactors. The course also covers fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations, axial and centrifugal fan performance characteristics; pump design and performance consideration; heat-exchanger design considerations. The course also includes applications of principles of economics to cycle and performance considerations use of load curves; economic considerations of heat rate; economics of equipment selection; study of auxiliary equipment such as precipitators and flue-gas desulfurization systems.

MET 1481 Materials B

(Prereq. MET 1380 or MET 4380)

The course focuses on the study of inorganic materials (polymers, glasses, ceramics, cements, wood), and materials having important electrical and magnetic properties. A summary of the most recent applications for the fabrication and uses of both metals and nonmetals. Structures of metals, imperfections, phase diagrams effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion) strengthening mechanisms, mechanical properties of nonferrous metals. Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of nonferrous metals, use of the microscope, linear analysis construction of cooling curves, and simple binary-phase diagrams.

MET 1482 Applied Metallurgy

(Prereq. MET 1481 or MET 4481)

Lectures include mechanical properties of ferrous

4 Q.H.

metals; the iron-carbon diagram; high-temperature alloys, hardening methods, impact tests, effects of environment on metals. Manufacturing processes: methods of fabrication, limitations on the use of different materials and their processing, casting, welding, cutting, drawing, powder metallurgy. Laboratory: includes experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swagging, drawing of nonferrous metals, and analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals.

MET 1499 Special Problems In Mechanical Engineering Technology

(Prereq. Consent of department chairperson)

Theoretical or experimental work under individual faculty supervision.

4 Q.H.

African-American Studies

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

AFR 1100 Introduction to African-American Studies**4 Q.H.**

The course touches on several of the possible historical, sociological, cultural, and political avenues of study in the broad interdisciplinary spectrum of African-American Studies. It is intended to help provide an introductory overview of the field and will offer students the opportunity to identify areas for more specific focus.

AFR 1115 Epidemiology of Black Diseases**4 Q.H.**

Students are introduced to the science of epidemiology, the study of the occurrence of disease in populations. The concepts, principles, and methods of epidemiological analysis are explored, with emphasis on specific diseases occurring with greater frequency in urban and black populations, such as cardiovascular conditions, sickle cell disease, and certain occupational and environmental illnesses.

AFR 1127 African-American Literature I**4 Q.H.**

The course offers a survey of African-American literature from the period of slavery to the present, with an emphasis on literature concerning the relation between the rise of the black American and the development of African-American literature. The black experience as it is revealed in literature will be important in the discussion.

AFR 1131 African-American History I**4 Q.H.**

This survey covers the development of black America from the period of slavery through Reconstruction, with emphasis on the historical links between Africa and America and their impact on black development in the United States.

AFR 1132 African-American History II**4 Q.H.**

(Prereq. AFR 1131 or permission of instructor)

This course examines the development of black America from Reconstruction to the present, and the effects of events in the United States and world history on the development of black America. There is special emphasis on contemporary issues and how these issues can be seen through a historical perspective.

AFC 1133 History of Blacks in the Media and the Press**4 Q.H.**

The course offers a historical and visual examination of the development of the African-American experience in the American mass media and press. Contemporary and historical literature, films, and people are a part of the study and analysis with respect to history, racism, images, psychology, and social movements. Newspapers, film, television, and radio are prime focal points, and they are used to help form strategies for the future of black Americans.

AFR 1141 Education Issues and Minority Communities I**4 Q.H.**

This course focuses on some of the important issues

in today's urban elementary and secondary education systems. The analysis will look at the historical development of these issues, and students will be encouraged to think about and discuss their future significance.

AFR 1150 Black Cultural Development in the United States 4 Q.H.

The course focuses on the rise of a distinctive black culture in the United States, with emphasis on examining the premise that the black population in America has developed a cultural system that operates as a subsystem of the American cultural norm.

AFR 1151 Survey of African-American Art 4 Q.H.

Black art, like black literature, has always been an important aesthetic social statement by the African-American artist. This course offers a historical and critical examination of African-American art from the nineteenth century to the present, with special emphasis on the effects of European and African art styles on the black artist in America.

AFR 1153 Survey of African-American Music 4 Q.H.

Black music has evolved in fascinating ways over the past hundred years. Topics include the impact of African rhythm on black music, the New Orleans coalescence, regional development, ragtime, the emergence of large bands, the harmonic revolution of the '40s, bebop, the 1960s avant-garde, and subsequent developments. Some analysis of specific jazz phenomena is included. This is the same as MUS 1104.

AFR 1156 Music of Africa 4 Q.H.

The music of Africa is as varied as that continent's many linguistic and tribal identities. This course will provide a broad survey of the musical traditions of Africa with respect to their historical, social, and cultural backgrounds. Musical organization, musical practice, and aspects of style will all be discussed in light of possible contributions to contemporary African-American music. Same as MUS 1181.

AFR 1161 Economic Issues in Minority Communities 4 Q.H.

Minority lifestyles, perspectives, self-images and social position in the urban community are all affected by economic factors, especially those specific to the minority poor. Students have the opportunity to examine these issues, particularly in terms of the application of basic economic theories to the economic realities of minority communities. (VI)

AFR 1171 Survey of Contemporary Black Political Movements 4 Q.H.

The modern black political movements were inspired by a full-scale evolution of black political thought in America. Analysis of this evolution examines socio-political contests that have served as catalysts to these modern movements.

AFR 1191 Early African Civilization 4 Q.H.

This course deals with the ancient empires of Africa, especially Ghana, Songhai, Mali, Zimbabwe, the city states of East Africa, and also the Congo Kingdom. Included are Ethiopian as well as Egyptian history and the controversies surrounding their histories to 1800.

AFR 1193 Africa Today 4 Q.H.

With increasing numbers of nations striving for economic and political control in Africa, and with imperialist and colonial ideas remaining in the living memory of Africans, Africa presents a complex political and social picture to the rest of the world. This course examines some of the salient features of black art, politics, and identity in Africa.

AFR 1195 Identity and Nationalism In Africa 4 Q.H.

How have centuries of imperialism, the struggle for national unity, and the continuing problems of racism and rivalry between factions affected the present identities and nationalist movements in Africa? This course explores problems peculiar to Africa and to any group of nations struggling against colonial ideas. Tribalism and the effects of European colonial partition on African identity are discussed.

AFR 1196 The Black Experience in the Caribbean 4 Q.H.

The course offers a descriptive and interpretive analysis of the growth of the modern black community in the Caribbean. Although the focus will be on the contemporary period, the course will examine that period in the context of colonialism and slavery in the Americas. Important racial, social, political, economic, and religious issues will be addressed.

AFR 1197 Modern African Civilization 4 Q.H.

This course will cover African history and culture from 1800 to the present era. Emphasis will be placed on the relationship between Europe and Africa, the circumstances surrounding the imperialist partition of Africa, and the decolonization process. This course is the same as HST 1621. (IV)

AFR 1211 African-Americans in Science, Technology, and Medicine 4 Q.H.

The course studies the contributions that African-Americans have made to the development of science and technology in America. It examines the cultural and social factors that have encouraged blacks to work in the fields of science (biology, chemistry, physics) and technology (engineering and medicine). Certification of blacks within the American scientific community and the availability of science to the past and contemporary African-American communities are also explored. Readings, discussions, individual research topics, and interviews with black scientists, inventors/engineers, and doctors are used to develop the basic course material.

AFR 1214 Poverty and Health Care 4 Q.H.

Why do the poor fail to get good health care? The course discusses problems of the poor and will

examine the entire health care system, including Blue Cross and Blue Shield, Medicare and Medicaid, National Health Insurance, low-income barriers to health care, and future directions of medical health care.

AFR 1220 The Black Novel 4 Q.H.

The black novelist belongs to a unique literary group in the history of American fiction. Special attention is given to Chesnutt, Toomer, Wright, Ellison, and contemporary novelists, and to their different perceptions of the black experience in America.

AFR 1223 Black Poetry 4 Q.H.

Black poetry has been an important describer of the black experience in American thought through three centuries. This course will survey the black American poet from colonial times to the present. Special attention will be given to major poets and the influences that shaped their works.

AFR 1235 Black History of Boston 4 Q.H.

This course examines the social, economic, political, and educational history of Boston's black community in the nineteenth and twentieth centuries. The development of the black community and its institutions is a major focus, and students are encouraged to study the past in an attempt to understand the present and interpret the future. Research data include participant observation, oral history, interviews, and primary and secondary source materials.

AFR 1240 Contemporary Issues in Black Society 4 Q.H.

This course offers an introduction to the various issues and problems that confront black Americans, including some of the realities of the social, political, and economic problems of contemporary black experience. Students are asked to assess the validity of specific social theories in relation to the black experience.

AFR 1241 The Black Family 4 Q.H.

How does the black family function, both interpersonally and as a social unit? Anthropological and sociological theories deal with variations in family structure and the function of the black family in black society. The effects of slavery and colonization on the black family structure and functions are also explored. A side issue is a discussion of some of the differences and similarities between African, African-American, and African-Caribbean families.

AFR 1248 Race Relations in America 4 Q.H.

The course offers an examination of the interrelations of ethnic, cultural, and minority groups in the United States. Focus is on the nature of racial conflicts, discrimination, reverse discrimination, personal and institutional racism, and racial and ethnic stereotyping. Discussion considers avenues of improvement in attitude awareness and change.

AFR 1251 Survey of Black Theatre and Drama 4 Q.H.

Theatre in America has been an important reflector of the national experience, and black theatre, especially

in recent years, has served the same purpose for the black community. The course focuses on the development of black drama during the nineteenth and twentieth centuries, with emphasis on modern developments and their political and cultural significance.

AFR 1261 The Economics of Urban Poverty 4 Q.H.

Like most Americans and people from around the world, blacks migrated to central cities in America to better their economic conditions. However, unlike other migrants to urban centers, they were not assimilated into the social/economic mainstream, and there is evidence of flagrant job, housing, and educational discrimination against them even during periods of affluence. During recession or depression, their problems were compounded. Students have the opportunity to survey the above events from an economic framework.

AFR 1274 Black Political Behavior 4 Q.H.

The course provides an introductory examination of the social and psychological dynamics of black political participation. Main issues of the course include identity and political socialization and their impact on black voter turnout and partisan choices.

AFR 1280 Black Psychological Identity 4 Q.H.

So much is said of stereotyping in news, on television programs, and in literature. The shaping of the black identity over three centuries in America is a complicated and perhaps even elusive problem. This course will look at the impact of slavery, racism, war, and poverty on the evolution of the black identity in America.

AFR 1294 Third World Political Relations 4 Q.H.

This course offers a comparative regional analysis of the political systems of third world nations of Africa, Asia, Latin America, and the Caribbean. Emphasis is on development strategies; problems of development, including national identity, political socialization and participation, national defense, and urbanization; and the positions of third world nations in the international community.

AFR 1297 Caribbean History 4 Q.H.

A descriptive analysis of the development of the Caribbean from slavery to the present. The focus will be on the period 1918-1962 especially, and emphasis will be on the historical analysis of the relationship of the Caribbean with the United States and black Americans.

AFR 1300-AFR 1311 Directed Study 4 Q.H.

Directed study offers the ambitious student the opportunity to pursue a special intellectual interest not covered by the department course offerings and to work on this interest with the department faculty member of his/her choice. The faculty member will closely supervise the project and act as adviser for the duration of the quarter.

AFR 1350 Research Seminar 4 Q.H.

This course is divided into three parts, providing students the opportunity, first, to identify a substantive

area of their concern (e.g., welfare, political leadership, education) and to define a related problem in a research context; second, to be supervised in designing a research methodology most appropriate for examining the problem area; and third, to conduct extensive research, test the hypothesis, and draw conclusions based on data analysis techniques.

AFR 1355 Directed Study for Senior Thesis 4 Q.H.
(Prereq. Permission of instructor)

The senior thesis is required of all African-American Studies majors; it offers students the opportunity to prepare a professional research paper under the close supervision of a scholar interested in students' particular research areas.

AFR 1360 Field Research Seminar 4 Q.H.
(Prereq. Permission of instructor)

Seniors have the opportunity to work with a faculty member on an individual basis, while carrying out a particular research project off-campus. Students are required to refine and polish a topic and outline for the senior thesis.

AFR 1380 Junior-Senior Honors Program 4 Q.H.
For details contact the Honors Office, 183 Holmes.

AFR 1401 History of East Africa 4 Q.H.

The first section of the course deals with the pre-colonial period and the problems of the partition of Africa. The second section focuses on the classical colonial period and the transformations of colonial policy after World War II, with particular emphasis on the ambiguity of decolonization and those features of the colonial system that seem to have become a part of the East African social and political environment.

AFR 1403 History of West Africa 4 Q.H.

The history of West Africa has included the struggle for internal unity, economic development, and social justice. The Pan-Africanist ideology, W.E.B. DuBois's writings, African socialism, and the consolidation of power and leadership are some of the topical objectives in this study of African liberation, particularly the rise of West Africa.

AFR 1405 History of South Africa 4 Q.H.
(Prereq. AFR 1491 or permission of instructor)

Initial attention is directed toward pre-colonial South Africa and the conflict between Africans and the Dutch and English settlers. The course then focuses on the formation and transformation of colonial policy after World War II, with particular emphasis on racism, neo-colonialism, liberation movements, and international involvement in the apartheid system. (VI)

AFR 1421 African-American Literature II 4 Q.H.
(Prereq. AFR 1121 or permission of instructor)

This course continues the survey of African-American literature; its primary focus, however, is on principal writers and their major themes.

AFR 1431 Analysis of the Slavery System in America 4 Q.H.

This course attempts a comprehensive survey of the realities of the slavery system in America, with focus

on the impact of slavery on blacks as well as on the society that perpetrated the system. Examination of slave narratives and other historical documents will provide insights into the origin of the slavery system and the way it functioned until the Emancipation Proclamation.

AFR 1432 Analysis of Comparative Slavery

4 Q.H.

Slavery has had major psychological effects on the shaping of the black American experience, as well as on the experience of blacks throughout the world. An analysis of the sociological implications of slavery on group interrelations, social norms, and cultural aberrations covers several national versions of the slave system in Africa, Europe, the Caribbean, and North and South America.

AFR 1440 Racial Integration and Its Impact on Education

4 Q.H.

This course offers an examination of the historical struggle for desegregation. This course analyzes current urban issues in racial integration and some of the projected effects of integration.

AFR 1446 The Black Elderly in America 4 Q.H.

This course will survey the demographic characteristics of black elderly Americans compared with those characteristics of white elderly. These statistics include age, sex, educational levels, income levels, occupations, sources of income, as well as the study and comparison of certain social characteristics of black and white elderly. These will include the use of their time relationships with primary and extended family groups, and their own view of the history of their lives as black people in America. They will also give students a perspective of what they envision the future of blacks will be in the social and economic life of America. Students will be expected to devise a questionnaire, interview senior citizens, and write a paper based on this information.

AFR 1448 Religion in Black American Society

4 Q.H.

Black life in America cannot be fully understood without a sense of the importance of religion in the community. This course looks at the impact of religion on social structures, group behaviors, moral codes, and belief patterns in black society. Topics include the church as a social organizer, the role of the black minister in the community, and the variety of black denominations in urban and rural areas.

AFR 1449 Junior-Senior Honors

4 Q.H.

For details contact the Honors Office, 183 Holmes.

AFR 1451 Seminar: Creative Expression in Blues and Jazz

4 Q.H.

Blues and jazz have been among the most far-reaching and original artistic expressions of blacks in America. The course touches on possible African sources of inspiration for the musical literature of blues and jazz; a more important focus, however, is on blues and jazz as a reflection of African-American life and on the impact these musical forms have had on black self-image and position in American culture.

AFR 1470 Black Political Thought 4 Q.H.

How do the black people as a unit view the American political system and black people's chances of improving their lot in this country? This course examines black opinions, from the radical to the ultra-conservative, of the United States political system. The focus is historical in context and will address notions of political socialization and the development of black political ideologies.

AFR 1471 Seminar: Black Political Leadership (Prereq. AFR 1171 or consent of instructor) 4 Q.H.

This course will focus on several prominent black political leaders in the twentieth century, with an examination of the factors and social contexts which contributed to or thwarted their leadership. Students will be expected to conduct extensive research on a particular black political leader and present a critical analysis of the impact of that political leader on the black community.

AFR 1475 Public Policy Analysis 4 Q.H.

The course analyzes the dynamics of the public policy formation process at the local, national, and international levels, with particular attention to the implications of public policy for minority groups. Emphasis is placed on a critique of the policy maker's role and power in the socio-economic setting.

AFR 1480 Black Man/Black Woman 4 Q.H.

Sociological and anthropological methods are used to examine black male and female personality development as well as the development of black male and female behavior, self-image, sexual roles, and behavior within both the black and the white communities.

AFR 1491 African Civilization II 4 Q.H.

(Prereq. AFR 1191 or permission of instructor)

This course on African civilization covers the period from 1800 to the present era. Emphasis will be placed on the relation between Europe and Africa, the circumstances surrounding the imperialist partition of Africa, and the decolonization process.

INT 1201 An Analysis of American Racism 4 Q.H.

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which our attitudes, in turn, shape our institutions. Emphasis is on the practical, day-to-day aspects of racism, rather than the theoretical and historical.

The following courses may be of interest to the student wishing to concentrate in African-American Studies. Descriptions for these courses may be found in the appropriate department listing.

PHL 1100 Introduction to Philosophy**PHL 1140 Social and Political Philosophy****PHL 1243 Existentialism****PHL 1335 Moral Philosophy****POL 1303 Political Behavior****POL 1317 Law and Society****POL 1320 Political Parties and Pressure Groups****POL 1342 Crisis and Conflict in Black Africa****POL 1354 The Politics and Policies of Developing Nations****POL 1360 The Politics of Revolution and Change****POL 1362 Civil Liberties****POL 1370 Political Theory****POL 1378 Contemporary Political Thought****POL 1386 International Law****SOA 1345 Urban Anthropology****SOA 1355 Political Anthropology****SOA 1360 Economic Anthropology****SOC 1147 Urban Society****SOC 1170 Race and Ethnic Relations****SOC 1310 Class, Power, and Social Change**

American Sign Language

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

American Sign Language courses are an integral part of two undergraduate degree programs: the human services specialization in deaf studies and the linguistics major. For more information, contact the American Sign Language Program, 276 Holmes Hall. See also human services and linguistics majors.

ASL courses do not satisfy the College of Arts and Sciences modern foreign language requirement for the BA, but they do satisfy humanities requirements of many major programs. Many students take them as free electives for personal or professional enrichment.

ASL 1101 American Sign Language I 4 Q.H.

An introduction to American Sign Language and Deaf culture, this course focuses on frequently used signs,

basic rules of grammar, nonmanual aspects of ASL, and some cultural features of the Deaf Community.

ASL 1102 American Sign Language II 4 Q.H.

(Prereq. ASL 1101 or permission of instructor)

A continuation of basic language and culture study, this course offers an opportunity to build receptive and expressive sign vocabulary. Study includes use of the signing space; further use of nonmanual components, including facial expression and body postures. Introduction to fingerspelling.

ASL 1201 Intermediate American Sign Language I 4 Q.H.

(Prereq. ASL 1102 or permission of instructor)

This course emphasizes further development of receptive and expressive skills, fingerspelling, vocabulary building, grammatical structures; encourages more creative use of expression, classifiers, body postures, and the signing space; introduces regional and ethnic sign variations and political and educational institutions of the Deaf Community.

ASL 1202 Intermediate American Sign Language II 4 Q.H.

(Prereq. ASL 1201 or permission of instructor)

The course consists of intensive practice involving expressive and receptive skills in story telling and dialogue; introduction to language forms used in ASL poetry and to the features of culture as they are displayed in art and the theatre.

ASL 1211 Deaf Culture 4 Q.H.

(Prereq. ASL 1101)

Course focuses on the status of Deaf people as a linguistic and cultural minority group. Topics include the role of American Sign Language in the Deaf Community; educational and historical perspectives on deafness; and sociological and cultural make-up of the Deaf Community.

ASL 1212 Deaf History 4 Q.H.

A survey of the history of Deaf people in the Western world, with emphasis on the American Deaf Community, their language, education, and relationship to hearing society.

ASL 1301 Advanced American Sign Language Proficiency 4 Q.H.

Emphasis is on further vocabulary building and mastery of fine points of grammar through rigorous receptive and expressive language activities. Included are student-led discussions, debates, and reports on topics in Deaf culture, society, and current affairs.

ASL 1401 American Sign Language Literature 4 Q.H.

(Prereq. ASL 1202)

Various genres of American Sign Language will be read and discussed in ASL. This course will concen-

trate on the work of current, recognized narrators in both literary and face-to-face storytelling traditions, and will also include selected autobiographical sketches, lectures, stories, and letters from the early 1900s by such historical figures as Clerc, Veditz, E.M. Gallaudet, and others. A videotaped research essay in ASL will be required at the end of the course.

ASL 1501 Sign Language Interpreting I 4 Q.H.

(Prereq. ASL 1301 or permission of instructor)

This is the first of a three-course sequence involving the theoretical and practical aspects of simultaneous interpretation of English into sign language and vice versa. Through lectures, discussions, and role playing, students are introduced to ethics, definitions, client-interpreter relationships, linguistic considerations, mechanics, and special considerations for various interpreting situations.

ASL 1502 Sign Language Interpreting II 4 Q.H.

(Prereq. ASL 1501 or consent of instructor)

Lectures, discussions, and role playing emphasize topics that include ethics, roles, fees, and Registry of Interpreters for the Deaf (R.I.D.) certification procedure. Laboratory work focuses on increasing skills in simultaneously interpreting English to sign language and vice versa.

ASL 1503 Sign Language Interpreting III 4 Q.H.

(Prereq. ASL 1502 or consent of instructor)

This course is designed for students who have completed the equivalent of Sign Language Interpreting I and II and wish to upgrade their skills. Laboratory work focuses on interpreting ASL into English and vice versa, and transliterating spoken English into manual English.

ASL 1504 Methods and Materials in American Sign Language Instruction 4 Q.H.

(Prereq. ASL 1202, PSY 1363)

This course offers a study of the theories of second-language learning and teaching as applied to ASL, and existing approaches to ASL instruction, with focus on materials, activity selection, utilization and selection of instructional media, and evaluation techniques.

ASL 1801, ASL 1802, ASL 1803, ASL 1804, ASL 1805 Directed Studies (each) 4 Q.H.

Directed Studies offer students an opportunity to go beyond course work of the regular curriculum or to pursue an individual learning project. May take the form of research, practicum, or language development activity.

Art and Architecture

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office before taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on page 1-2.

ART 1100 History of Art to 1400 4 Q.H.

The course provides a survey of Western art from prehistoric times to the Renaissance.

ART 1101 History of Art since 1400 4 Q.H.

The course provides a survey of Western art from the Renaissance to the twentieth century.

ART 1106 Introduction to Art 4 Q.H.

The course offers a basic introduction to the characteristics of the visual arts, including painting, sculpture, graphic arts, and architecture. Various examples of works of art are studied as an introduction to style and technique. Course includes visits to museum collections and contemporary art galleries. (II)

ART 1111 Introduction to Architecture 4 Q.H.

The course offers a survey of the stylistic characteristics of architecture from ancient times to the present.

ART 1113 Architecture and the City 4 Q.H.

This course provides a selective examination of Western architecture in the context of the urban environments that produced it. Special attention is paid to the cultural and social forces which shaped this architecture of the cities.

ART 1115 Art and Society 4 Q.H.

The course offers an examination of the way in which societal forces and political ideologies are expressed in the visual arts, especially in painting and architecture. The course combines a broad overview of a few significant historical periods with a more focused concentration on the past two hundred years.

ART 1124 Basic Drawing 4 Q.H.

The focus of the course is on basic drawing in pen and ink, pencil, charcoal, brush, and related media. Course includes fundamentals of form, volume, and texture in drawing.

ART 1127 Basic Painting 4 Q.H.

This is an introductory studio course in the fundamental techniques of painting. Formal problems in the study of color, light, space systems, form, and composition establish the foundation for more individual creative expression. Critiques and slide lectures are used as needed.

ART 1130 Foundations of Visual Design 4 Q.H.

An introductory studio course clarifying basic principles, language, and concepts inherent in visual language systems. Utilizing both two- and three-dimensional media including photography, students will explore such fundamental concepts as composition, dimensional relationships, effects of color, pictorial and literal space and form, repetition, structure,

figure/ground relationships, balance and unity. By working out abstract concepts in concrete hands-on studio projects, students will gain valuable insights into fundamental visual ideas that relate all visual art forms.

ART 1132 Graphic Design I 4 Q.H.

An introductory studio course in the fundamental principles of graphic design. Assigned projects and lectures in design elements and their application include: the creative use of color, value, line, shape and form, layout, layout techniques and tools, typography, design concepts and symbols, and the correlation of graphic expression and organization with copy content in communicating ideas.

ART 1138 Introduction to Printmaking 4 Q.H.

A hands-on course dealing with the methods and techniques of etching, drypoint, and calligraphy. Students will experiment with the processes of line etching, aquatint, soft/hard ground and paper relief prints as they develop an image. Slide presentations of prints will be shown each week.

ART 1150 Introduction to Architectural Design

4 Q.H.

An introduction to fundamental design principles and their application to the built environment. Lectures, two- and three-dimensional design projects, and field trips.

ART 1160 Basic Photography I 4 Q.H.*

The course is intended to acquaint the beginning student with the use of the camera, the negative, and the print. Weekly shooting assignments, demonstrations, and hands-on lab experience are part of this active, primary-level course.

ART 1170 Filmmaking Workshop 4 Q.H.

An introductory course in the creative use of the film medium. Emphasis will be placed on weekly lab assignments designed to develop skills in the fundamental techniques of filmmaking. A final film project expressing an original idea in film form will be required of each student. Film screenings, lectures, and critiques. Equipment will be provided by the department.

ART 1171 Animation Workshop 4 Q.H.

An introductory course in the creative possibilities of the animated film. Weekly lab assignments and a final project will acquaint students with various animation techniques and the creative advantages of each. Film screenings, lectures, and critiques. Equipment will be provided by the department.

*Lab fee required.

ART 1200 Ancient Art and Architecture 4 Q.H.

This course offers an overview of the painting, sculpture, and architecture of Ancient Egypt, Mesopotamia, Greece, and Rome, with special emphasis on the historical forces that shaped them.

ART 1203 Medieval Art and Architecture 4 Q.H.

The course focuses on Romanesque and Gothic art and architecture from the tenth to the fifteenth centuries.

ART 1204 Renaissance Art and Architecture 4 Q.H.

The course focuses on Italian painting, sculpture, and architecture of the fifteenth and sixteenth centuries, with special reference to the historical and social forces that shaped them.

ART 1210 French Painting 4 Q.H.

The course examines French painting of the nineteenth century, focusing on romanticism, realism, impressionism, and their cultural implications.

ART 1213 Modern Painting 4 Q.H.

The course provides a survey of twentieth-century painting, including major schools such as impressionism, cubism, surrealism, and expressionism. Course includes visits to museum collections and contemporary art galleries.

ART 1217 History of Marine Painting 4 Q.H.

A study of the image of the sea as used by various painters. The work of such artists as Turner, Delacroix, Monet, Rembrandt, and many others will be examined stylistically within a historical context.

ART 1220 American Sculpture and Painting 4 Q.H.

A survey of major developments in American sculpture and painting from colonial times to the present. This course emphasizes stylistic considerations and influences affecting the development of these art forms.

ART 1223 American Architecture 4 Q.H.

This course provides a survey of major developments in American architecture from colonial times to the present, with emphasis on stylistic developments and influences affecting architectural directions in America.

ART 1225 Technology, Architecture, and the City 4 Q.H.

The course examines the role technology and architecture played in shaping the built environment of the American city, with special emphasis on Chicago, New York, and Boston. The course also investigates the effects of physical planning, especially urban renewal and the recycling of older buildings.

ART 1228 Contemporary Architecture and the City 4 Q.H.

The course is a study of the great figures and chief

movements of American and European architecture and city planning of the twentieth century.

ART 1230 History of Photography 4 Q.H.

The course offers a study of the development of photography from the early nineteenth century to the present.

ART 1233 Contemporary Directions in Photography 4 Q.H.

A slide/lecture course designed to acquaint the student with trends in twentieth-century photography. Photojournalism, documentary, commercial, and creative photography will be examined closely in relation to other communication media.

ART 1235 History of Film 4 Q.H.*

An introductory historical survey of the development of film as an art form from the late nineteenth-century handcolored silent films to the contemporary national movements. Lectures, screenings, and discussions.

ART 1236 The American Film 4 Q.H.*

An historical survey of the unique rise of the American film and an exploration of its influence on a burgeoning new art form. Key films representing major aesthetic or technical developments from the late nineteenth century to the present will be screened weekly and discussed. Lectures, screenings, and discussions.

ART 1237 Contemporary Directions in Cinema 4 Q.H.*

A comparative study of major international film movements from World War II to the present. Selected films by representative contemporary directors. Lectures, screenings, and discussions.

ART 1238 Documentary Film 4 Q.H.*

A study of the aesthetics and tradition of the documentary film, with a major emphasis on contemporary directions.

ART 1240 History of Graphic Design 4 Q.H.

An historical survey of graphic design from the mid-nineteenth century to the present. The course will focus on the evolutionary development of graphic design, its special nature and function, major periods and trends, the historical influence of the fine arts, and contemporary directions in design evident today. Slide lectures and discussions.

ART 1243 Graphic Design II 4 Q.H.

A continuation and reinforcement of the fundamental practices and principles of good design with a special emphasis on developing overall design concepts. Students will explore the inherent problems in designing public graphic systems, exhibit graphics, corporate and institutional graphics, promotional and technical literature graphics, and develop skills in effective problem-solving techniques and concept development methodology.

* Lab fee required.

ART 1250 Color Theory and Practice 4 Q.H.

A project-oriented course exploring the nature and properties of color, major color theories, color harmonies, the spatial characteristics of color, color and light, the psychology of color, color symbolism, color orchestration, and the pragmatic creative application of color in image-making generally, and design specifically.

ART 1254 Intermediate Drawing 4 Q.H.

The main focus of this course is to heighten the student's understanding of spatial awareness, scale movement, and expression. Students will be asked to create unusual environmental situations for their figurative compositions. A variety of media will be used, including wash, pen and ink, watercolor, chalk, charcoal, and pencil.

ART 1261 Basic Photography II 4 Q.H.*

(Prereq. ART 1160 or equiv.)

A continuation of ART 1160 with more emphasis on combining personal aesthetic choices with refining darkroom skills. A final portfolio at the end of the course as well as weekly shooting assignments are required.

ART 1263 Introduction to Color Photography 4 Q.H.*

An introduction to shooting, processing, and printing color negative films. Lecture will cover basic color theory in relationship to photography as well as contemporary color photographic processes. Working with color negative films, students will get hands-on experience in the C-41 process for developing film and the EP-2 process for printing color negatives. Emphasis in the weekly assignments will be on solving technical and aesthetic problems inherent in dealing with color negative-materials. The hands-on lab will allow the student to produce the final project. Color chemistry and facilities are provided.

ART 1271 Animation Workshop 4 Q.H.

An introductory course in the creative possibilities of the animated film. Weekly lab assignments and a final project will acquaint students with various animation techniques and the creative advantages of each. Film screenings, lectures, and critiques. Equipment supplied by the department.

ART 1310 Seminar in Modern Art and Architecture 4 Q.H.

(Prereq. One course in post-Renaissance art history or permission.)

The course explores selected topics in modern art and/or architecture.

ART 1320 Late Nineteenth-Century American Architecture 4 Q.H.

(Prereq. ART 220 or ART 223, or permission.)

The course offers a study of the "stick and shingle" architectural styles, as well as more general developments. Introductory lectures are followed by student presentations on selected topics.

ART 1363 Intermediate Photography Workshop 4 Q.H.*

(Prereq. ART 1261 or equiv.)

Through close interaction with the teacher, students are asked to refine their technical skills and to make meaningful decisions about their relation to the world around them through the use of black and white photography. Alternative processes and large formats as well as frequent slide presentations of contemporary photography will combine together to form a base for a course stressing individual direction and a qualitative approach to substantive photography.

ART 1800, ART 1801, ART 1802 Directed Study (each) 4 Q.H.

These courses offer independent work under the direction of members of the Department on a chosen topic. Limited to qualified junior and senior students majoring in art, with approval of the department.

ART 1810, ART 1811, ART 1812 Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

INT 1100 Introduction to Art, Drama, and Music 4 Q.H.

This interdisciplinary course offers an integrated approach to three related disciplines: art, drama, and music. Basic vocabulary and analytical techniques are established for each discipline, emphasizing such common elements as color, line, rhythm, texture, and form. Representative works from various periods are examined in the context of the cultures that produced them, and lectures focus on parallels and contrasts among the three disciplines' manifestations of specific trends, principles, and ideals. Lectures, readings, and listening assignments are supplemented by visits to art galleries and attendance at concerts and theatrical performances. (II)

*Lab fee required.

Biology

For specific information about terms during which courses are offered, students should inquire at the main office of the Biology Department, 403 Richards Hall. This is especially the case for students wishing to carry a minor in biology, since some courses acceptable only for a minor do not appear in the quarterly Elective Course Selection booklets. Students should note that courses are presented by category and are not listed in a single numerical sequence.

Students should be aware that two (or more) courses with substantially the same content may not be counted toward quantitative graduation requirements. Some instances of overlap between biology courses are noted in the individual course descriptions below. However, in addition, certain combinations of courses (e.g., BIO 1150-1151 and BIO 1253, -54, -55) may cover essentially the same material, and certain courses in other departments of the University may duplicate certain biology courses. If a student is not sure whether particular courses overlap, the student should seek advice from departmental advisers or the Arts and Sciences Dean's Office.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

The following courses are primarily for students with little or no background in college science and mathematics. These courses are not open to biology majors.

BIO 1110 Organic Evolution **4 Q.H.**
(Not open to biology majors)

The course focuses on the major features of organic evolution, with emphasis on vertebrate evolution, genetics, and physical influences.

BIO 1111 Environment and Man **4 Q.H.**
(Not open to biology majors)

The course offers an ecological analysis of man's inter-reaction with other organisms. The necessary foundation of biological principles is presented.

BIO 1150 Human Anatomy and Physiology I **5 Q.H.***
(Not open to biology majors)

The course focuses on cellular and tissue structure and function, followed by anatomical terminology. Topics include histology, anatomy, and physiology of bones, muscles, blood, and nervous systems. The laboratory includes a study of human bones, cat dissection, and related histology.

BIO 1151 Human Anatomy and Physiology II **5 Q.H.***
(Prereq. BIO 1150)

(Not open to biology majors)
The course covers anatomy and physiology of the respiratory, digestive, urogenital, and circulatory systems; physiology of endocrine system; a brief exploration of the anatomy and physiology of eye and ear. The laboratory includes studies of muscle and nerve physiology, blood physiology and histology, and physiology of respiration.

BIO 1170 Marine Biology **4 Q.H.**
(Not open to biology majors)

The course provides an introduction to marine life with an emphasis on that of New England shores, and includes concepts of life cycles, adaptation of organisms, productivity, disturbance effects due to pollution and/or man and how they interrelate.

BIO 1181 The Human Organism **4 Q.H.***
(Not open to biology majors)

This course, designed for nonscience majors, provides an introduction to the structure and function of the human body. Emphasis is on the principles of biological and physical science as they relate to life processes in health and disease. Laboratory experiments explore the workings of the students' own biological systems rather than those of other animals.

BIO 1187 Biology of Human Reproduction **4 Q.H.**
(Not open to biology majors)

The course covers structure and function of male and female reproductive systems; factors affecting sexual development, fertility, and reproductive behavior in the human species; physiology of coitus, fertilization, pregnancy, birth, and lactation; methods of controlling fertility.

The following courses are primarily for students majoring in science- or health-related professions or other majors (nonbiology) with equivalent background in college science and mathematics. These courses are not open to biology majors.

BIO 1112 Ecological Principles **3 Q.H.**
(Prereq. Nonbiology science majors or engineering majors)

Identical to BIO 1211, but without lab. Not open to biology majors. (II)

BIO 1120 Basic Microbiology **4 Q.H.***
(Prereq. BIO 1140, or permission of instructor; not open to biology majors)

Microbial life, emphasizing morphological characteristics, physiological activities, and disease production. Laboratory. (Overlaps BIO 1320, BIO 1121, and BIO 1221.)

BIO 1121 Introductory Microbiology **3 Q.H.**
(Not open to biology majors)

Same as BIO 1120, but without laboratory.

*Lab fee required.

BIO 1140 Basic Animal Biology I 4 Q.H.*
(Not open to biology majors)

The course covers principles of biology; universal properties and processes of living organisms as exemplified by the cell and its activities; inheritance evolution; and environmental relationships. Laboratory. (Overlaps BIO 1106.)

BIO 1141 Basic Animal Biology II 4 Q.H.*
(Prereq. BIO 1140; not open to biology majors)

The course offers systematic, comparative study of the structure and functions of animals. Diversity of animals is considered from the standpoint of evolutionary adaptation. Laboratory. (Overlaps BIO 1107.)

BIO 1221 General Microbiology 3 Q.H.

(Prereq. Permission of instructor; or CHM 1265, BIO 1260, and BIO 1261; required courses may be taken concurrently)

Same as BIO 1320, but without laboratory. Not applicable for the biology major or graduate credit.

BIO 1255 Human Anatomy 4 Q.H.*
(Not open to biology majors)

The course focuses on the structure and development of the human body. Laboratory.

Courses primarily for biology majors or for other students with equivalent background in college science and mathematics. Freshmen intending to major in biology should take the sequence BIO 1103 to BIO 1105.

BIO 1103 Principles of Biology I 5 Q.H.*

An introduction to the basic principles of biology, the course endeavors to provide an information base for the remainder of the biology core. Topics include scientific method; cell metabolism; growth; development; elementary genetics; nutrition; photosynthesis; and respiration. Laboratory.

BIO 1104 Principles of Biology II 5 Q.H.*
(Prereq. BIO 1103)

Topics include structure and function of vertebrate animals, structure and general physiology of animal cells, and evolution of adaptive diversity among invertebrate animals. Laboratory.

BIO 1105 Principles of Biology III 5 Q.H.*
(Prereq. BIO 1103 and BIO 1104)

The course covers discussion of the molecular mechanisms of microbial and plant life; introduction to the various systems of plants and their role in the biological world, illustrated with laboratory experiments and dissection.

BIO 1106 General Biology 4 Q.H.*

The course focuses on universal properties and processes of living organisms. Topics include cellular composition and cellular control, the evolutionary process, environmental relationships. Laboratory. (Normally not for freshman biology majors. Overlaps BIO 1140.)

BIO 1107 Animal Biology 4 Q.H.*
(Prereq. BIO 1106)

The course offers a systematic comparative study of

the structure and functions of animals. Diversity of animals is considered from the standpoint of evolutionary adaptation. Laboratory. (Normally not for freshman biology majors. Overlaps BIO 1141.)

BIO 1133 Plant Biology 4 Q.H.*

(Prereq. BIO 1106-BIO 1107 or BIO 1103-BIO 1105)

The course offers an introduction to the structure of plant cells, structure and function of roots, stems, and leaves of flowering plants; survey of the major groups in the plant kingdom, including their morphology, reproductive biology, and economic importance. Laboratory.

BIO 1211 Environmental and Population Biology 4 Q.H.*

(Prereq. BIO 1107-BIO 1133 or BIO 1103-BIO 1105)

The course offers detailed consideration of the physico-chemical factors influencing and influenced by organisms. The course covers interactions among individual organisms and among species; change of species by genetic natural selection; development of communities and function of ecosystems. Laboratory. (II)

BIO 1253 Human Physiology I 4 Q.H.*

(Prereq. BIO 1106 and BIO 1107 or BIO 1103-1105)

The course offers study of the physiology of excitable cells and tissues: nerve and muscle synapses, muscular contraction, neuromuscular reflexes, autonomic nervous system, endocrinology, sensory physiology, and higher nervous function. Laboratory.

BIO 1254 Human Physiology II 4 Q.H.*

(Prereq. BIO 1253)

The course offers study of respiration and circulation: fluids, the heart, cardiovascular regulatory mechanisms and metabolism, gastrointestinal function, renal function. Laboratory.

BIO 1260 Genetics and Development Biology 4 Q.H.*

(Prereq. BIO 1107-BIO 1133 or BIO 1103-BIO 1105 and CHM 1264)

Course focuses on elaboration of the classic laws of heredity, cytogenetics, molecular basis of heredity, and selected examples of the development of form and function. Laboratory.

BIO 1261 Cell Physiology and Biochemistry 4 Q.H.*

(Prereq. BIO 1107 or BIO 1103-BIO 1105 and BIO 1260, CHM 1265, and CHM 1221)

Topics include basic chemical and physical enzyme kinetics; processes of cells related to their fine structure; oxidative and intermediary metabolism; photosynthesis, membrane phenomena; chemical and physical processes of prokaryotic and eukaryotic cells. Laboratory.

BIO 1270 Diving Research Methods 4 Q.H.*
(Prereq. SCUBA Certification)

A field-oriented course designed to introduce students to techniques in the study, ecology, and physiology of subtidal marine organisms. The course will

* Lab fee required.

consist of the description of underwater research methods, their appropriate applications, and their implementation during field exercises under water. Topics to be covered include diving physiology, sampling design, experimental design, statistical analysis of data, population censusing methods, under water measurements of hydrodynamics, *in situ* respirometry, underwater telemetry, underwater photography, and the use of underwater habitats and submersibles in research.

BIO 1311 Evolution 4 Q.H.*
(Prereq. BIO 1107 or BIO 1103-BIO 1105 and BIO 1260)

This is a basic evolutionary course for biology majors and graduate students offering a survey of evolutionary history, evidence, mechanisms, and theories. Topics of current interest in evolution are emphasized.

BIO 1320 General Microbiology 5 Q.H.*
(Prereq. Permission of instructor; or CHM 1265, BIO 1260, or BIO 1261; required courses may be taken concurrently)

The course provides morphological, ecological, and biochemical consideration of representative groups of bacteria; introduction to virology and microbial genetics; host-parasite relationships, including basic immunological considerations; prokaryotes of medical significance; physical and chemical controls of microbial growth. Laboratory. (Overlaps BIO 1120 and BIO 1221.)

BIO 1328 The Microbial World 4 Q.H.*
(Prereq. BIO 1211 and CHM 1264)

The course offers study of the position, structure, and function of microorganisms in the natural world, and their utilization by humans from the perspective of their major physiological properties. Laboratory.

BIO 1329 Marine and Fresh Water Microbiology I 2 Q.H.*
(Prereq. BIO 1320)

The course examines methodological approaches to the study of the aquatic environment. Shipboard sampling and relevant field trips augment laboratory studies.

BIO 1330 Marine Botany 4 Q.H.*

Subjects covered include taxonomy of the major groups of marine plants, primarily algae; their ecological and reproductive strategies and their economic importance; and their roles in diverse marine communities. Mandatory field trips in addition to laboratory studies.

BIO 1341 Vertebrate Zoology 4 Q.H.*
(Prereq. BIO 1107 or BIO 1105 and BIO 1211)

Lectures emphasize the systematics, natural history, zoogeography, and behavior of all classes of vertebrates. The laboratory consists of identification of preserved specimens and mandatory field and museum trips.

BIO 1347 Embryology 5 Q.H.*
(Prereq. BIO 1107 or BIO 1105 and BIO 1260)

Topics include gametogenesis, fertilization, cleavage, gastrulation, induction, organogenesis, and metamorphosis in vertebrates. Emphasis is on frog, chick, and pig in the laboratory.

BIO 1348 Animal Histology 4 Q.H.*
(Prereq. BIO 1131)

The course offers microscopic study of fundamental types of animal tissues. Laboratory.

BIO 1351 Comparative Vertebrate Anatomy 5 Q.H.*
(Prereq. BIO 1107 or BIO 1105)

The course focuses on morphology and phylogeny of the vertebrates; laboratory studies on taxonomy of the group and specific morphology of the dogfish shark, the mud puppy, the alligator, and the cat.

BIO 1370 Marine Invertebrate Zoology 5 Q.H.*
(Prereq. BIO 1107 or BIO 1105)

Topics include functional morphology, systematics, ecology, and phylogenetic relationships of the major invertebrate phyla. Emphasis in laboratory is on utilization of living marine forms, with dissection of representative organisms.

BIO 1371 Biological Oceanography 4 Q.H.*
(Prereq. BIO 1104, 1107, or 1141 or equivalent)

A lecture and laboratory course encompassing the principles of biological oceanography. The topics include physical and chemical aspects of the ocean environment, the distribution, production, and interactions of marine planktonic organisms, and ecosystem characteristics of specific oceanographic environments. Special emphasis is given to participation in sampling and analysis using current instrumentation and methods.

BIO 1401 Histological Technique 3 Q.H.*
(Prereq. BIO 1107 or BIO 1105 and BIO 1261)

The course provides instruction in general methods of tissue preparation for purposes of microscopic study; preparation of solutions and stains; the microtome and its operation, together with specific directions for fixation, clearing, hardening, embedding, section-cutting, and staining tissues. Laboratory.

BIO 1411 Tropical Terrestrial Ecosystems 3 Q.H.
(Prereq. two years of college biology)

A field and lecture course to introduce students to the plants, animals, and ecosystems of terrestrial Jamaica.

BIO 1412 Benthic Marine Ecology 4 Q.H.*
(Prereq. BIO 1211; BIO 1341 recommended)

This course involves a study of the interactions among bottom-dwelling invertebrates, fish, and plants and their environment. Quantitative field methods and new developments in ecological theory will be applied to examinations of the rocky intertidal zone, soft sediment areas, salt marshes, and the rocky subtidal zone.

* Lab fee required.

BIO 1420 Microbial Physiology 4 Q.H.*

(Prereq. BIO 1320 or equiv.)

The course focuses on structure and function of the bacterial cell, with emphasis on its general properties as well as on the physical and chemical factors that influence it. Laboratory.

BIO 1421 Medical Virology 4 Q.H.*

(Prereq. BIO 1320)

The course examines fundamental characteristics of animal viruses with emphasis on pathogenesis, clinical pathology, and epidemiology of the common viral diseases, including the tumor viruses and the slow viral diseases. Laboratory sessions focus on methods of working with animals, eggs, and cell cultures in isolating, cultivating, and identifying viruses.

BIO 1427 Medical Microbiology 4 Q.H.*

(Prereq. BIO 1320 or equiv.)

Topics include host parasite interactions: virulence, toxins, natural flora, immunological responses; characteristics of the common bacterial, rickettsial, and protozoal infections in humans; epidemiology, pathology, vaccines, and chemotherapy.

BIO 1429 Marine and Fresh Water Microbiology II 2 Q.H.*

(Prereq. BIO 1320)

The course focuses on characterization and differentiation of aquatic micro-organisms. Topics include microbial associations in marine, estuarine, and fresh water habitats. Morphology, physiology, and ecology are stressed.

BIO 1430 Plant Physiology 4 Q.H.*

(Prereq. BIO 1133 or BIO 1105 and CHM 1265)

The course focuses on the physiology and biochemistry of plants as a whole and at the cellular and organ levels. Considerations of mineral and nutrition, photosynthesis, hormones, growth, and development are included. Attendance at a weekly four-hour lab, as well as preparation of a paper based on the research literature, is required.

BIO 1431 Lower Plants 4 Q.H.*

(Prereq. BIO 1133 or BIO 1105)

The course offers study of nonvascular plants (algae, fungi, lichens, mosses, and liverworts), including their morphology, ultrastructure, ecology, life cycles, reproductive strategies, and economic uses. Laboratory.

BIO 1432 Higher Plants 4 Q.H.*

(Prereq. BIO 1133 or BIO 1105))

The course offers study of vascular plants (club mosses, ferns, gymnosperms, and angiosperms). Origin, ecology, development, structure, paleobotanical evidence, reproductive strategies, and economic uses. Field trips included. Laboratory.

BIO 1437 Structural Botany 4 Q.H.*

(Prereq. BIO 1133 or BIO 1105)

The course focuses on comparative developmental anatomy of seed plants. Laboratory.

BIO 1438 Flora of New England 4 Q.H.*

(Prereq. BIO 1133 or BIO 1105)

The course provides a study of local vascular flora

(ferns, gymnosperms, and angiosperms), with emphasis on recognition and appreciation of plant family characteristics. Preparation of herbarium specimens is presented. Field trip attendance is required. Laboratory.

BIO 1439 Economic Botany 4 Q.H.*

(Prereq. BIO 1133, or BIO 1103-BIO 1105)

The course offers an in-depth study of the association of plants and men. Subjects include food, beverage, drug, fiber, and medicinal products and crops, both historically and in present-day usage. Laboratory includes making of several plant products (paper, dried fruit, beer, etc.) as well as tours of a brewery, wholesale grocers, ethnic markets, sugar factory, and other places as time permits.

BIO 1440 Advanced Invertebrate Zoology 4 Q.H.*

(Prereq. Two years of college biology)

A lecture, field, and laboratory course that concentrates on one or two phyla. Subject varies from year to year, depending upon expertise of available faculty. An individual research project is required.

BIO 1441 Parasitology 4 Q.H.*

(Prereq. BIO 1107 or BIO 1105 and BIO 1261)

The course focuses on symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropodes. Laboratory.

BIO 1442 Vertebrate Paleontology 4 Q.H.*

(Prereq. BIO 1107 or BIO 1105, BIO 1211, BIO 1260; or permission of instructor)

The course examines evolution of the vertebrates, including humans, as revealed through the fossil record. Laboratory, museum, and field studies.

BIO 1447 Herpetology 4 Q.H.*

(Prereq. BIO 1107 or BIO 1105 and BIO 1260)

Lectures emphasize the natural history, behavior, systematics, and zoogeography of recent amphibians and reptiles. The laboratory consists of identification and preparation of preserved specimens, particularly local amphibians and reptiles. Mandatory field trips.

BIO 1448 Mammalogy 5 Q.H.*

(Prereq. BIO 1107 or BIO 1105 and BIO 1211)

The course offers study of phylogeny, anatomy, physiology, and natural history of mammals. Field collection, laboratory preparation, and study of specimens are included. Laboratory.

BIO 1449 Marine Birds and Mammals 4 Q.H.*

(Prereq. BIO 1211 and BIO 1104, 1107, or 1141)

A comparative study of the biology of birds and mammals associated with the marine environment, with laboratory emphasis on species that occur along the New England coast. Topics will include phylogeny, systematics, zoogeography, morphology, physiology, reproduction, behavior, and ecology. Laboratory subjects will include identification, dissections, and specimen preparation.

* Lab fee required.

BIO 1452 Comparative Neurobiology 4 Q.H.*

(Prereq. BIO 1261)

The course focuses on structure and function in simple invertebrate nervous systems. Topics include parallel conductance theory at endogenous and synaptic potentials, nerve networks, simple sensory and motor systems.

BIO 1453 General Physiology of Invertebrates

(Prereq. BIO 1261) **4 Q.H.***

Basic animal functions as manifested among the major groups of invertebrates, with comparisons to the vertebrates, especially aquatic vertebrates. The course considers the cellular and biochemical bases for the functions, their control, their adaptiveness to diverse environments, and their evolutionary implications. Topics usually include: respiration, circulation, nutrition, metabolism, excretion, salt and water balance, temperature responses, biological clocks, sensory organs, and various effector organs.

BIO 1454 Comparative Vertebrate Physiology

(Prereq. BIO 1261) **4 Q.H.***

This course considers physiological principles in the context of the phylogenetic diversity of the vertebrates, with emphasis on adaptations of animals to aspects of their life histories and environments. Comparisons with invertebrate systems will be made when appropriate. Major themes to be considered include: energetics, temperature, circulation, respiration, skeletal muscle, and salt and water balance. Laboratory.

BIO 1457 Neuroethology

(Prereq. BIO 1105) **4 Q.H.***

A lecture, field, and laboratory course concentrating on the mechanisms underlying behavior of model invertebrates and lower vertebrates. The overall goal will be to develop a framework to explain behavior in terms of properties and connectivity of neuronal circuits. Topics to be covered include: the cellular biology of neurons and neuronal circuits, the organization of sensory and motor systems, and field and laboratory analysis of simple behaviors.

BIO 1460 Current Concepts in Cell Biology 4 Q.H.*

(Prereq. BIO 1261 and physics)

The course examines selected topics in cellular structure and function of eukaryotes, e.g., their electrical and mechanical characteristics and the underlying physical and biochemical processes. Topics will vary depending upon the instructor. Laboratory.

BIO 1465 Introductory Immunology

(Prereq. 1261) **3 Q.H.**

The course covers basic consideration of the physical and chemical attributes of antigens and antibodies. Antigens of biological significance as well as in vivo antigen-antibody interactions are discussed.

BIO 1466 Immunology Laboratory

(Prereq. BIO 1465 taken concurrently) **2 Q.H.***

The course provides laboratory exercises dealing

with immunization, quantitative antigen-antibody reactions, electrophoretic studies (agar, acrylamide gel, and cellulose acetate), immuno-fluorescence.

BIO 1467 Molecular Biology

(Prereq. BIO 1261) **4 Q.H.**

The course emphasizes experimental design and proof in macro-molecular chemistry and genetics. Studies current theories of the detailed molecular mechanisms for the preservation, expression, and evolutionary development of biological information. Applications to general biological and health problems will be emphasized. A two-hour period each week will be devoted to problem solving, research "game playing," and model building.

BIO 1470 Coastal Biology (Oregon Coast) 4 Q.H.

The first of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the Oregon Coast. Basic biological principles will be demonstrated through comparative studies.

BIO 1471 Coastal Biology (Caribbean Coast)

4 Q.H.

The second of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the Caribbean. Basic biological principles will be demonstrated through comparative studies.

BIO 1472 Coastal Biology (New England Coast)

4 Q.H.

The third of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the New England Coast. Basic biological principles will be demonstrated through comparative studies.

BIO 1477 The Biology of Corals

(Prereq. Two years of college biology) **4 Q.H.**

A field, lecture, and laboratory course which concentrates on tropical cnidaria. The course will study the systematics, anatomy, physiology and ecology of this group of animals which assume such an important role in tropical marine ecosystems.

BIO 1478 The Biology of Fishes

(Prereq. Two years of college biology) **5 Q.H.**

A field, lecture, and laboratory course that examines the systematics, anatomy, behavior and ecology of fishes. Tropical forms are emphasized.

BIO 1479 Adaptations of Aquatic Organisms

(Prereq. Two years of college biology) **4 Q.H.**

An exploration of aquatic organisms through a study of their evolutionary responses to the aquatic habitat.

* Lab fee required.

The physical properties of water create physical constraints that have affected form, function, and behavior of all aquatic organisms. Density, viscosity, diffusion rates, pressure effects, and elementary fluid mechanics will be used to explain such characteristics as the body shape of larvae, hearing and sound production, suspension feeding, and buoyancy. Course includes lectures, laboratories, demonstrations, and individual research projects.

BIO 1490 Senior Seminar 1 Q.H.

(Prereq. Completion of "Biocore" BIO 1103-BIO 1261)
The course examines recent developments in various topics of zoology, microbiology, physiology, botany, ecology, genetics, and cell biology. Student presentation and analysis are emphasized. Limited to qualified juniors and seniors in the B.A. program and required of seniors in the B.S. program.

BIO 1491, BIO 1492 Directed Study (each) 2 Q.H.

(Prereq. Completion of "Biocore" BIO 1103-BIO 1261)
The course offers independent work on a chosen topic under the direction of members of the department. Limited to qualified juniors and seniors with approval of the department and special arrangements with the supervising faculty member. The two quarters of this course together are counted as one elective course in the Biology Department.

BIO 1495, BIO 1496, BIO 1497, BIO 1498 Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

BIO 1811 Field Studies: Resource Management 5 Q.H.

(Prereq. BIO 1107 or equivalent)
Offered through the School for Field Studies.

A field course that offers a study of the principles of resource management involving ecological concepts, physical geography, and methods for conducting resource inventories as affected by pressures of development from agriculture, urbanization, pollution, and industrialization.

BIO 1812 Field Studies: Wildlife Biology and Management 5 Q.H.

(Prereq. BIO 1107 or equivalent)
Offered through the School for Field Studies.
A field course that examines the taxonomy, anatomy, and ecological interactions of animals and forage plants with emphasis on evolutionary perspective; includes a study of techniques for the census of populations.

BIO 1813 Field Studies: Exotic Ecosystems 5 Q.H.

(Prereq. BIO 1107 or equivalent)
Offered through the School for Field Studies.
A field course in which basic ecological principles are applied to the study of world biomes with special emphasis on the tropics or the Arctic. Includes an individual research project that will demonstrate ecological principles.

BIO 1814 Field Studies: Population and Community Ecology 5 Q.H.

(Prereq. BIO 1107 and BIO 1211 or equivalents; college algebra)
Offered through the School for Field Studies.
A field course that offers an ecological analysis of a specific region (Kenya, Alaska, or the Caribbean) by means of rigorous quantitative techniques and their application to determine efficacy in the field.

INT 1580 Physical Chemistry with Biological Applications 4 Q.H.

(Prereq. BIO 1261)
This course examines physiochemical principles as they apply to biological processes. Topics include chemical equilibria, reaction kinetics, basic thermodynamics, oxidation-reduction reactions, bioenergetics, macromolecules in solution, and transport. The approach is quantitative, and problem solving as a tool for learning is emphasized. Basic assumptions and limitations underlying principles are explained; for the most part, however, rigorous derivations are avoided. Applications to basic experimental techniques in biochemistry are made by way of relevant biochemical examples.

Chemistry

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on page 1-2.

Introductory Chemistry Courses

CHM 1101 General Chemistry for Health-related Majors I 4 Q.H.

This course examines topics of interest in inorganic chemistry for students in health-related majors. Topics

include: atomic structure; energy changes in physical and chemical processes; stoichiometry; chemical bonding; gases, liquids, and solids; solutions; acids and bases. The emphasis is on how such ideas are related to the chemistry of the body.

CHM 1102 General Chemistry for Health-related Majors II 4 Q.H.

(Prereq. CHM 1101)

This course provides an introduction to organic substances of biological significance, and goes on to discuss the structure and reactions of proteins, carbohydrates, lipids, and nucleic acids as well as the major pathways of metabolism.

CHM 1104 Composition of the Oceans 4 Q.H.

Seawater, its nonliving components, and the changes they undergo during natural and technological activities. Principles illustrated include the structures of substances and solutions, dynamic equilibrium, nuclear and ionic reactions, and the dynamics of pollution, as they relate to the oceans. The course presupposes an exposure to chemistry in secondary school. The course is not recommended for students who have completed a college-level chemistry course and is not for students majoring in any science.

CHM 1111 General Chemistry for the Life Sciences I 5 Q.H.*

This course, designed for nonchemistry majors, focuses on basic concepts and definitions; the mole concept and chemical stoichiometry, states of matter, solutions, periodicity of elements, atomic structure, chemical bonding and reactions. (II)

CHM 1112 General Chemistry for the Life Sciences IIA 5 Q.H.

(Prereq. CHM 1111)

This course, for students who will not be taking further chemistry, covers chemical equilibria; acids, bases, and buffers; introduction to the organic chemistry of compounds of biological relevance; introductory biochemistry of proteins, carbohydrates, lipids, and nucleic acids.

CHM 1122 General Chemistry for the Life Sciences IIB 5 Q.H.*

(Prereq. CHM 1111)

For nonchemistry majors who will be taking CHM 1264, Organic Chemistry. Subjects covered include chemical kinetics and equilibria; acids and bases; elementary thermodynamics and kinetics; electrolysis and electrochemistry. (II)

CHM 1131 General Chemistry for Engineering Students I 4 Q.H.

Primarily for engineering students. Introduction to the principles of chemistry, focusing upon the states and structure of matter and chemical stoichiometry.

CHM 1132 General Chemistry for Engineering Students II 4 Q.H.

(Prereq. CHM 1131)

Primarily for engineering students, the course offers an introduction to the principles of chemistry, focusing upon chemical equilibria, the nature of some common materials, and energy considerations in chemical and nuclear transformations.

CHM 1138 General Chemistry Laboratory 1 Q.H.*

Required for students planning to major in Chemical Engineering. Optional for other students taking CHM 1132, General Chemistry for Engineering Students II. Experiments pertaining to lecture material.

CHM 1141 General Chemistry I (nonlaboratory) 4 Q.H.

Similar to CHM 1151, but without laboratory. (Not available to majors from chemistry, biology, or pharmacy/allied health sciences.)

CHM 1142 General Chemistry II (nonlaboratory) 4 Q.H.

Similar to CHM 1152, but without laboratory. (Not available to majors from chemistry, biology, or pharmacy/allied health sciences.)

CHM 1151 General Chemistry for Science Majors I 5 Q.H.*

For chemistry majors and selected students in other majors, such as biology, physics, etc. Course focuses on basic concepts and definitions, moles, gas laws, stoichiometry, atomic structure, periodic properties, chemical bonding.

CHM 1152 General Chemistry for Science Majors II 5 Q.H.*

(Prereq. CHM 1151 or CHM 1141) Topics include solutions, chemical kinetics, chemical equilibrium, chemical thermodynamics, electrochemistry, chemistry of the representative elements.

CHM 1153 The Chemical Elements 5 Q.H.*

(Prereq. CHM 1132, CHM 1122, CHM 1152, or equiv.) For chemistry majors and selected students in other majors. The principal concepts of chemistry (thermodynamics, chemical bonding, kinetics) are applied to a systematic survey of the characteristic behavior of the chemical elements and their compounds.

Advanced Chemistry Courses**CHM 1221 Analytical Chemistry** 4 Q.H.*

(Prereq. CHM 1122 or equiv.) For nonchemistry majors. The principles and applications of chemical methods of analysis with an introduction to selected instrumental methods.

CHM 1223 Chemical Oceanography 4 Q.H.*

(Prereq. CHM 1132, CHM 1122, CHM 1152, or equiv.) Chemical reactions and interactions in the marine environment. Methods and techniques of marine chemical investigation.

CHM 1231 Analytical Chemistry for Chemistry Majors 5 Q.H.*

(Prereq. CHM 1122, CHM 1152, or equiv.) For chemistry majors. The principles and practice of chemical methods of analysis. Experimental planning and interpretation. Introduction to selected instrumental methods.

* Lab fee required.

CHM 1264 Organic Chemistry for the Life Sciences I**5 Q.H.***

(Prereq. CHM 1122, CHM 1152, or equiv.)

For nonchemistry majors. Course covers nomenclature, preparation, properties, and reactions of common organic compounds.

CHM 1265 Organic Chemistry for the Life Sciences II**5 Q.H.***

(Prereq. CHM 1264)

Continuation of CHM 1264.

CHM 1271 Organic Chemistry for Chemistry Majors and Chemical Engineering Students I**3 Q.H.**

(Prereq. CHM 1153)

For chemistry majors and selected students in other majors. Course covers synthesis and properties of aliphatic and aromatic hydrocarbons and their functional derivatives; correlation between the structure of organic compounds and their physical and chemical properties; and electronic interpretation of organic reactions.

CHM 1272 Organic Chemistry for Chemistry Majors and Chemical Engineering Students II**5 Q.H.***

(Prereq. CHM 1271)

Continuation of CHM 1271.

CHM 1273 Organic Chemistry for Chemistry Majors and Chemical Engineering Students III**5 Q.H.***

(Prereq. CHM 1272)

Continuation of CHM 1272.

CHM 1381 Physical Chemistry I**3 Q.H.**

Chemical thermodynamics.

CHM 1382 Physical Chemistry II**3 Q.H.**

Topics include phase equilibria, solutions, kinetic theory of gases, transport properties, and chemical kinetics.

CHM 1383 Physical Chemistry III**3 Q.H.**

Course covers quantum chemistry, particles and waves, Schrodinger wave mechanics, and the chemical bond.

CHM 1394 Experimental Physical Chemistry I**2 Q.H.***

(Prereq. CHM 1381 concurrently)

This course covers experiments from various physical chemistry topics presented in CHM 1381.

CHM 1395 Experimental Physical Chemistry II**2 Q.H.***

(Prereq. CHM 1382 concurrently)

This course covers experiments from various physical chemistry topics presented in CHM 1382.

CHM 1396 Experimental Physical Chemistry III**2 Q.H.***

(Prereq. CHM 1383 concurrently)

This course covers experiments from various physical chemistry topics presented in CHM 1383.

CHM 1421 Instrumental Analysis**3 Q.H.**

(Prereq. CHM 1221, CHM 1231, or equiv.)

For nonchemistry majors only. Similar to CHM 1431, but without laboratory.

CHM 1431 Instrumental Analysis**5 Q.H.***

(Prereq. CHM 1392 and CHM 1231)

Course focuses on principles, methods, and applications of selected topics in electrometric, chromatographic, and spectroscopic analysis.

CHM 1441 Inorganic Chemistry**4 Q.H.**

(Prereq. CHM 1393)

Topics include atomic properties of free atoms and ions. Ionic bonding and the structure of the solid state. The Madelung calculation; the Born-Haber and other thermodynamic cycles. Valence-bond, molecular, orbital, and crystal field theories of bonding. Stereochemistry of compounds of representative elements. Electron-deficient compounds. Spectral and magnetic properties of transition metal compounds.

CHM 1461 Identification of Organic Compounds

(Prereq. CHM 1265 or CHM 1273)

3 Q.H.*

The course examines qualitative analysis of organic compounds and mixtures, using physical, chemical, and instrumental methods.

CHM 1501 Polymer Chemistry I**3 Q.H.**

(Prereq. CHM 1273 or equiv.)

The course provides an introduction to polymers. Major emphasis on synthesis. Step-reaction, chain-reaction, and ring-opening polymerizations. Copolymerization. Three-dimensional polymers and cross-linking. Corresponds to graduate course CHM 3501.

CHM 1502 Polymer Chemistry II**3 Q.H.**

(Prereq. CHM 1392 or equiv.)

Topics include physical chemistry of polymers in solution and bulk. Molecular characterization. Mechanical and physical properties in the glassy, rubbery, viscous, and semicrystalline states. Corresponds to graduate course CHM 3502.

CHM 1503 Polymer Chemistry III**3 Q.H.**

(Prereq. CHM 1501 and CHM 1502)

Topics include industrial practice, polymer processing, fibers, elastomers, coatings, adhesives, reinforced plastics. Relation of polymer structure to usage. Corresponds to graduate course CHM 3503.

CHM 1521 Advanced Analytical Chemistry III

(Prereq. CHM 1431 or equiv.)

3 Q.H.

The course examines analytical separations. Corresponds to graduate course CHM 3521.

CHM 1523 Advanced Analytical Chemistry II

(Prereq. CHM 1431)

3 Q.H.

Electroanalytical. Corresponds to graduate course CHM 3523.

CHM 1525 Advanced Analytical Chemistry I

(Prereq. CHM 1431 or equiv.)

3 Q.H.

The course covers optical methods of analysis. Corresponds to graduate course CHM 3525.

*Lab fee required.

CHM 1541 Advanced Inorganic Chemistry I
(Prereq. CHM 1441) **3 Q.H.**
The course covers application of quantum chemistry to inorganic systems. Corresponds to graduate course CHM 3541.

CHM 1542 Advanced Inorganic Chemistry II
(Prereq. CHM 1541) **3 Q.H.**
Continuation of CHM 1541. Corresponds to graduate course CHM 3542.

CHM 1543 Advanced Inorganic Chemistry III
(Prereq. CHM 1542) **3 Q.H.**
Chemistry of the solid state. Corresponds to graduate course CHM 3543.

CHM 1561 Advanced Organic Chemistry I
(Prereq. CHM 1273 or CHM 1265) **3 Q.H.**
Course focuses on organic structure and reactions. Corresponds to graduate course CHM 3561.

CHM 1562 Advanced Organic Chemistry II
(Prereq. CHM 1561) **3 Q.H.**
The course examines organic structure and reactions. Corresponds to graduate course CHM 3562.

CHM 1563 Advanced Organic Chemistry III
(Prereq. CHM 1562) **3 Q.H.**
The course focuses on organic structure and properties. Corresponds to graduate course CHM 3563.

CHM 1564 Spectrophotometric Identification of Organic Compounds **3 Q.H.**
(Prereq. CHM 1273 or equiv.)
The course examines spectrophotometric identification of organic compounds. Corresponds to graduate course CHM 3564.

CHM 1581 Advanced Physical Chemistry I
(Prereq. CHM 1393) **3 Q.H.**
The course examines chemical thermodynamics. Corresponds to graduate course CHM 3581.

CHM 1591 Advanced Physical Chemistry II
(Prereq. CHM 1393) **3 Q.H.**
The course focuses on atomic and molecular structure. Corresponds to graduate course CHM 3591.

CHM 1594 Advanced Physical Chemistry III
(Prereq. CHM 1393) **3 Q.H.**
The course focuses on chemical kinetics. Corresponds to graduate course CHM 3594.

CHM 1800, CHM 1801, CHM 1802, CHM 1803, CHM 1804, CHM 1805 Undergraduate Research
(each) **4 Q.H.**

For chemistry majors. The course offers original experimental work under the direction of a staff member. Participation may begin in the middle year and will normally continue through the senior year. A minimum of a two-quarter commitment is required for participation. Approval of the administering committee is required.

CHM 1811 Advanced Chemical Laboratory Practice I **4 Q.H.***
(Prereq. CHM 1273, CHM 1395, CHM 1396, CHM 1431)

Laboratory projects in analytical, inorganic, organic, and physical chemistry carried out under the direction of a staff member. Approval of the administering committee is required.

CHM 1812 Advanced Chemical Laboratory Practice II **4 Q.H.***
(Prereq. CHM 1811)

Laboratory projects that may be a continuation of those done in Advanced Chemistry Laboratory Practice I or that may be in a different area under the supervision of the same or a different staff member. Approval of the administering committee is required.

CHM 1830 Special Topics **4 Q.H.**
(Prereq. CHM 1381)

CHM 1840, CHM 1841, CHM 1842, CHM 1843 Junior-Senior Honors Program (each) **4 Q.H.**
For details contact the Honors Office, 183 Holmes.

INT 1580 Physical Chemistry with Biological Applications **4 Q.H.**
(Prereq. BIO 1261)

This course examines physiochemical principles as they apply to biological processes. Topics include chemical equilibria, reaction kinetics, basic thermodynamics, oxidation-reduction reactions, bioenergetics, macromolecules in solution, and transport. The approach is quantitative, and problem solving as a tool for learning is emphasized. Basic assumptions and limitations underlying principles are explained; for the most part, however, rigorous derivations are avoided. Applications to basic experimental techniques in biochemistry are made by way of relevant biochemical examples.

* Lab fee required.

Economics

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on page 1-2.

Unless otherwise stated, there are no prerequisites for advanced economics courses. Where prerequisites are indicated, exceptions may be granted with the instructor's permission.

ECN 1105 Principles of Macroeconomics 4 Q.H.

This course introduces students to macroeconomic analysis, which deals with the functioning of the overall economy. Topics include review of national income concepts; national income determination, fluctuation, and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; balance of international payments.

ECN 1106 Principles of Microeconomics 4 Q.H.

The course examines the role of the market pricing system of demand and supply in determining the allocation of resources to competing uses, and why this system may not function adequately in certain cases. Study includes the application of economic principles to private and public problems.

ECN 1115 Principles of Macroeconomics 4 Q.H.

The course offers an introduction to macroeconomic analysis. Topics include the flow of national income: economic growth and fluctuation; the role of money and banking; monetary and fiscal policies. Emphasis is on assisting students in developing conceptual tools for use in the analysis of economic problems facing modern society. (II)

ECN 1116 Principles of Microeconomics 4 Q.H.

The course focuses on development of basic theory of demand, supply, and market price. Applications to selected microeconomic problems such as basic monopoly and competition, and other issues that relate to the role of the pricing system in resource allocation and income distribution. (II)

ECN 1130 Medical Economics 4 Q.H.

Examination and discussion of health-care trends in the United States and selected foreign countries; causes of the rising costs of medical care; the particular nature of the demand for health-care services; the demand for paramedical personnel; Certificate of Need committees; health maintenance organizations; medical malpractice; increases in life expectancy and its impact on society; third-party payers; and the true cost of medical education.

ECN 1140 Economics of Crime 4 Q.H.

Economic analysis of crime and the criminal justice system. Topics include theoretical and empirical analysis of the economic causes of criminal behavior; the social costs of crime and its prevention, and design of enforcement policies.

ECN 1150 Economics of World Energy and Primary Resources 4 Q.H.

(Prereq. ECN 1105/1115 or 1106/1116)

Investigation of economic, political, and historical backgrounds of the energy and other resources problems. Future impact of primary resources limitations on United States and world economics are analyzed. Also included are feasibility studies of resource substitution.

ECN 1155 Superpower Economics 4 Q.H.

This course offers an analysis of the relative economic structure and strength of the United States, the Soviet Union, Japan, the Common Market, and China, as well as the economic relations among these powers. The course also examines the impact of these relations on the domestic economies of the superpowers and of the developing nations of the world.

ECN 1170 Economic Issues In Minority Communities 4 Q.H.

Analysis of the economic conditions of nonwhite minorities within the U.S. economy. Historical and cultural materials will be included, as well as specific theoretical and empirical analysis of the economic problems confronting minority communities. (VI)

ECN 1215 Macroeconomic Theory 4 Q.H.

(Prereq. ECN 1105, ECN 1115, or equiv.)

Investigation of the conceptual and empirical problems of creating and using national accounts; price index problems; conceptual and empirical evaluation of consumption and investment functions and their policy implications; multiplier and accelerator models; a brief history of recent cyclical fluctuations. Theories of inflation, unemployment and growth are analyzed in the light of recent economic history.

ECN 1216 Microeconomic Theory 4 Q.H.

(Prereq. ECN 1106, ECN 1116, or equiv.)

Detailed study of supply-and-demand analysis, various elasticity concepts and applications, theory of consumer demand, theory of production, and derivation of cost curves. Detailed analyses of pricing and output behavior in the several market structures with their welfare implications; the pricing of resources.

ECN 1250 Statistics I 4 Q.H.

Topics include elementary set theory, basic probability, measurement and presentation of economic statistics, descriptive statistics, basic estimation techniques, testing statistical hypotheses, and sampling problems.

ECN 1251 Statistics II**4 Q.H.**

(Prereq. ECN 1250)

Topics include analysis of variance, correlation and linear regression analysis, multivariate regression analysis, and Bayesian decision making.

ECN 1310 Labor Economics**4 Q.H.**

(Prereq. ECN 1106/1116 or 1105/1115)

Economic analysis of the labor market and the labor force. Topics include the supply, development and efficient use of human resources; wage determination; the changing occupational and industrial structure; causes, nature and incidence of unemployment; the economic impact of unions, related labor market institutions and relevant public policies.

ECN 1311 Employment and Training Programs and Policies**4 Q.H.**

(Prereq. ECN 1105/1115)

Nature and objectives of employment and training programs; nature and causes of human resource problems; current and previous efforts to solve human resource problems in the U.S.; planning of human resource programs; economic evaluation of employment and training programs.

ECN 1312 Women in the Labor Market**4 Q.H.**

(Prereq. 1106/1116)

Economic analysis of the labor market position of women in the context of the changing economic structure and labor market institutions. Analysis of female labor force participation differences; male-female differentials in earnings and unemployment; occupational concentration, occupational segregation, and theories and evidence of sex discrimination; new opportunities for women.

ECN 1313 Local Labor Market Analysis and Human Resource Planning**4 Q.H.**

(Prereq. ECN 1115 and ECN 1116, or ECN 1105 and ECN 1106; ECN 1310 strongly recommended)

Introduction to methods and data sources for analyzing conditions in regional, state, and local labor markets. The primary aim is to determine the extent, nature, and causes of human resource problems and to utilize that information in planning and designing appropriate employment and training strategies.

ECN 1314 Economics of Education and Human Capital**4 Q.H.**

(Prereq. ECN 1115 and ECN 1116, or ECN 1105 and ECN 1106; ECN 1311 strongly recommended)

Theoretical and empirical treatment of economic issues related to education and job training, including formal education (pre-school through post-secondary), vocational education, on-the-job training, and government-sponsored employment and training programs. Emphasis is on follow-up studies, cost-effectiveness analysis, and benefit-cost analysis for determining the effectiveness of education and training investments from a private and social standpoint.

ECN 1315 Income Inequalities and Discrimination(Prereq. ECN 1106/1116 or 1105/1115) **4 Q.H.**

Economic analysis of income inequalities, poverty and discrimination. Examination of the causes of income inequality and the nature, causes and effects of poverty; economics of racial discrimination; public welfare system and other income maintenance schemes.

ECN 1320 Urban Economics**4 Q.H.**

(Prereq. ECN 1106/1116)

Study of urban growth and development, intermetropolitan location of business firms, regional shifts in economic activity, intra-metropolitan location of firms and households, and land use patterns.

ECN 1321 Urban Economic Problems and Policies

(Prereq. ECN 1106/1116)

4 Q.H.

Sequel to ECN 1320.

Economic analysis of selected urban problems such as housing, poverty, transportation, education, health, crime, and the urban environment. Discussion of public policies relating to such problems.

ECN 1322 Economics of Transportation**4 Q.H.**

(Prereq. ECN 1106/1116)

Transportation and land-use patterns; externalities; social costs and social benefits of various modes of transportation, ownership, regulations, and financing of various modes of transportation; economics of new technology in transportation.

ECN 1330 Development Economics**4 Q.H.**

(Prereq. ECN 1105/1115 or 1106/1116)

Prospects for economic growth and development in poor nations as indicated by economic analysis and historical experience; social, cultural, and institutional determinants of growth; analysis of agriculture and development, the role of technological change, population; and foreign trade. (V)

ECN 1331 American Economic Development**4 Q.H.**

Economic development of the United States from the colonial period to the present, historical changes in available factors, economic institutions and technologies, special attention to preconditions of industrialism; the American Industrial Revolution, its spread and socio-economic consequences; the Great Depression and the subsequent rise of mixed economy and welfare state; U.S. adjustments to postwar economic changes.

ECN 1332 Economic History of Less Developed Countries**4 Q.H.**

(Prereq. ECN 1105/1115 and 1106/1116)

The problems of initiating and sustaining economic development in selected Third World countries during the last two hundred years. Country-specific case studies cover the role of traditional economic structures, different development goals and strategies, state policies, and international economic relations.

ECN 1333 European Economic Development**4 Q.H.**

Economic inheritance of the nineteenth-century development of capitalism and laissez-faire; the aftermath of the Industrial Revolution, European overseas expansion, the twentieth century, the world wars, the dissolution of empires, American economic conquest and European integration, the future of less developed areas in southern Europe; environmental impact of industrialism and the implications of technological society. (III)

ECN 1334 Comparative Economics**4 Q.H.**

(Prereq. ECN 1105/1115, 1106/1116)

Competing types of theoretical economic systems; analysis of organization and operation of currently existing types of communist, socialist, and capitalist economies; comparison and evaluation of economic behavior and performance of different economic systems.

ECN 1335 International Economics**4 Q.H.**

(Prereq. ECN 1115, ECN 1116 or equiv.)

Introduction to the theory of international trade and payments; analysis of tariffs and commercial policy; the international monetary system; trade and payment issues in developed and less-developed countries.

ECN 1337 History of Economic Thought**4 Q.H.**

(Prereq. ECN 1105/1115/1106/1116)

The evolution of Western economic thought. By studying several important schools in economics, the course examines the questions raised and analytical methods used by economists to study human behavior.

ECN 1340 Government Expenditures: Structure and Evaluation**4 Q.H.**

(Prereq. ECN 1106, ECN 1116, or equiv.)

Fiscal functions of government, fiscal institutions and politics, theory of social goods, public expenditure growth and structure, the federal budget expenditure evaluation and cost-benefit case studies, fiscal federalism in theory and practice; and issues of public debt and deficit.

ECN 1341 Financing of Government: Taxation and Debt**4 Q.H.**

(Prereq. ECN 1106, ECN 1116, or equiv.)

Principles of taxation; problems of tax structure and reform, at federal, state, and local levels; tax incidence; effects of taxation on economic efficiency and growth; negative income tax and social security finance; issues of public debt and deficit.

ECN 1342 Money and Banking**4 Q.H.**

(Prereq. ECN 1105, ECN 1115, or equiv.)

A study of the nature and the functions of money, credit, and the role of financial organizations in the U.S. economy. The basic theories of banking, the money supply, monetary theory, and monetary policy will be emphasized.

ECN 1345 Business Cycles and Inflation**4 Q.H.**

(Prereq. ECN 1105 or ECN 1115; ECN 1106 or ECN 1116; ECN 1215)

A study of the theories of business cycles and inflation and an empirical application of these theories to

current business cycle, inflation, and stagflation problems.

ECN 1350 Introduction to Econometrics**4 Q.H.**

(Prereq. ECN 1105 or ECN 1115; ECN 1106 or ECN 1116; and ECN 1251)

Introduction to the methods of econometric analysis and forecasting. Coverage includes: ordinary least squares, piecewise regression, tests and corrections for serial correlation and heteroskedasticity, specification analysis, simultaneous equations systems, errors in variables, dynamic models and elementary forecasting.

ECN 1351 Problems in Economic Research**4 Q.H.**

(Prereq. ECN 1105 or ECN 1115; ECN 1106 or ECN 1116; ECN 1251)

Examination of research methods utilized by practicing economists. A discussion, from applied areas of economics, of typical problems, including choice of modeling framework; problems of data collection; review of estimation techniques; interpretation of results and development of static and dynamic adaptive policy models.

ECN 1353 Introduction to Mathematics for Economists**4 Q.H.**

(Prereq. ECN 1115 or ECN 1105; ECN 1116 or ECN 1106)

Basic tools of mathematics, matrix algebra, differential and integral calculus and classical optimization are studied with special reference to their application in economics.

ECN 1354 Mathematics for Economists**4 Q.H.**

(Prereq. ECN 1353 or permission of instructor)

For economics, mathematics, business, and engineering students interested in a broad coverage of economic analysis using mathematical techniques. Static and dynamic models of micro- and macroeconomics are studied using differential and difference equations, mathematical programming and game theory.

ECN 1360 Managerial Economics**4 Q.H.**

(Prereq. ECN 1116 or ECN 1106)

Application of economic principles and theory, by the use of case studies, to the solution of decision-making problems in such areas as demand forecasting, price policies, estimation and control of costs, financing of capital investments, and responses to government taxation and regulation policies.

ECN 1361 Social Control of Economic Activities**4 Q.H.**

Development of the government's role in economic activities, examining the relation between the government and industry, labor, agriculture, public utilities, and consumers. The course will trace the changing role of the government from a laissez-faire policy to one of direct intervention in the economy. Covers such topics as wage and price control, environment and antipollution policies, consumer protection, and conglomerate mergers.

ECN 1362 Industrial Organization and Public Policy 4 Q.H.
(Prereq. ECN 1216/1106/1116)

An analytic framework and empirical study of how the structure of industrial organization and conduct of sellers and buyers affects economic performance and welfare. Industrial examples and case studies included. An examination of antitrust as a public policy designed to promote better market performances.

ECN 1401 Advanced Economic Theory 4 Q.H.
(Prereq. ECN 1216 and ECN 1215)

Advanced theoretical treatment of selected topics in micro- and macroeconomics. Recommended for students planning to take graduate economics.

ECN 1481 Directed Study 1 Q.H.
(Prereq. Qualified senior economics majors and approval of department chair)

This course offers independent work on a chosen topic under the direction of a faculty member of the department. It should not be substituted for the course requirements leading to a B.A. or B.S. degree in Economics. Up to four quarter hours per offering, with an eight quarter-hour maximum. May be taken only with the prior approval of department chairperson.

ECN 1482 Directed Study 2 Q.H.
(Prereq. Qualified senior economics majors and approval of department chair)

This course offers independent work on a chosen topic under the direction of a faculty member of the department. It should not be substituted for the course requirements leading to a B.A. or B.S. degree in Economics. Up to four quarter hours per offering,

with an eight-quarter hour maximum. May be taken only with the prior approval of department chairperson.

ECN 1483 Directed Study 3 Q.H.
(Prereq. Qualified senior economics majors and approval of department chair)

This course offers independent work on a chosen topic under the direction of a faculty member of the department. It should not be substituted for the course requirements leading to a B.A. or B.S. degree in Economics. Up to four quarter hours per offering, with an eight-quarter hour maximum. May be taken only with the prior approval of department chairperson.

ECN 1484 Directed Study 4 Q.H.
(Prereq. Qualified senior economics majors and approval of department chair)

This course offers independent work on a chosen topic under the direction of a faculty member of the department. It should not be substituted for the course requirements leading to a B.A. or B.S. degree in Economics. Up to four quarter hours per offering, with an eight-quarter hour maximum. May be taken only with the prior approval of department chairperson.

ECN 1492 Senior Economics Seminar 4 Q.H.
(Prereq. ECN 1216 and ECN 1215; senior economics majors only)

Coordinating and applying economic concepts, methodology, and data to contemporary issues and problems of broad social, economic, and philosophical importance.

ECN 1495, ECN 1496, ECN 1497, ECN 1498
Junior-Senior Honors Program (each) 4 Q.H.
For details contact the Honors Office, 183 Holmes.

English

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on page 1-2.

Unless otherwise indicated, the prerequisite for upperclass courses is a Freshman English sequence. For students in the Basic Colleges this means ENG 1110 and ENG 1111; ENG 1013, ENG 1014, and ENG 1111; ENG 1110, ENG 1014 and ENG 1111. For the College of Engineering, ENG 1111, and ENG 1113. For Lincoln College, ENG 1110, ENG 1111, and ENG 1114; ENG 1110, ENG 1014, ENG 1111, and ENG 1114; or ENG 1013, ENG 1014, ENG 1111, and ENG 1114. And for international students, ENG 1005 and ENG 1006.

ENG 1001 Intensive English as a Second Language
Reviews English grammar to help non-native speakers to develop listening, speaking, reading, writing, and studying skills. Language laboratory, and small-group tutorials.

ENG 1004 Fundamentals of English for Non-native Speakers 4 Q.H.
(Prereq. Special placement—For non-native speakers whose performance or scores indicate that their writing skills are not yet up to those required for ENG 1005.)

Provides intensive practice in composition with accent on accurate, intelligible writing and paragraphs organized around single, well-supported ideas. Encourages sentence-combining and vocabulary development, and gives special attention to individual writing needs. Includes prose readings, class discussion, and selective review of grammar.

ENG 1005 English for International Students I
(Prereq. ENG 1004 or special placement) 4 Q.H.
Emphasizes the development of skills needed in

writing clear, expository prose essays. Requires the regular writing and rewriting of essays of increasing length and complexity. Focuses on appropriate prose readings for discussion and analysis, and introduces techniques preparatory to research writing.

ENG 1006 English for International Students II **4 Q.H.**

(Prereq. ENG 1005 or equiv.)

Introduces the study of literature through close reading and discussion of fiction, nonfiction, and poetry. Advances development of rhetorical techniques by requiring frequent essays written in relation to the readings and rewritten to improve content, organization, and diction. Provides guided experience with using outside sources and library materials for writing a term paper.

ENG 1013 Fundamentals of English I **4 Q.H.**
(Prereq. Special placement)

Offers an introduction to principles of the writing process. Emphasizes individualized assistance in generating and developing ideas, drafting, revising, and organizing; and the conventions of written English.

ENG 1014 Fundamentals of English II **4 Q.H.**
(Prereq. ENG 1013 or ENG 1110)

Continues instruction in writing, emphasizing exposition, argument, and academic essay writing, as well as the conventions of English usage, punctuation and syntax. Individualized assistance in invention, drafting, revision, and editing.

ENG 1110 Freshman English I **4 Q.H.**

Focuses on the individual student's writing skills. Includes application of important principles of composing, logic and rhetoric to exposition and argumentation. Reviews of sentence structure, punctuation and paragraphing, analyzes essay forms and problems. Students receiving a grade of S must take ENG 1014.

ENG 1111 Freshman English II **4 Q.H.**
(Prereq. ENG 1110 or ENG 1014)

Continues instruction in writing, with emphasis on expository methods of defining, describing, analyzing, persuading, and composing the research paper. Students write lengthy critical essays based on consideration of primary and secondary materials. Selections of poems, stories, and plays provide an introduction to literature and are the subject matter for discussion of writing technique and written assignments. ENG 1111 follows ENG 1110 and is required of all freshmen in the University.

ENG 1113 Great Themes in Literature **4 Q.H.**

Explores a theme in literature through a number of illustrative works from the past and the present. Develops techniques of research and documentation.

ENG 1114 Freshman Technical Writing **4 Q.H.**
(Prereq. ENG 1110, ENG 1111)

Provides Bachelor of Engineering Technology students with the how-to's of writing technical descrip-

tion, graphics, instruction sets, proposals and reports. Includes oral presentations.

ENG 1115 Poetry **4 Q.H.**
Involves exercise in close reading of selected poems, study of critical terms, and practice in different critical approaches to poetry; examines techniques for reading a variety of poetic texts. (II)

ENG 1116 Fiction **4 Q.H.**
Involves reading of selected novels and short stories, study of critical terms, practice in different critical approaches to fiction. (II)

ENG 1117 Drama **4 Q.H.**
Involves extensive exercise in reading of selected plays, study of critical terms, practice in different critical approaches to drama. (II)

ENG 1118 Introduction to Language and Linguistics **4 Q.H.**

Introduces students to a new way of thinking about language. Normally, using language is as unconscious an activity as walking or chewing gum. But if we ask the right questions, we can uncover much of our unconscious linguistic knowledge: about sentence structure (syntax), meaning (semantics), word forms (morphology), and speech sounds (phonology). Understanding these will lead us to examine other issues related to language: the Black English/Standard English debate, women's and men's language, "talking" chimpanzees, "talking" computers, and the nature/nurture controversy. (II)

ENG 1119 History of the English Language **4 Q.H.**

Studies the development of modern English from Anglo-Saxon beginnings; effects of Scandinavian and Norman invasions; dialect geography; evolutionary changes, word formation and borrowing; origins of writing and problems of spelling. Readings include both formal and informal writings, literary selections, wills, journals, and private and public letters.

ENG 1120 Survey of English Literature I **4 Q.H.**

Surveys the major British writers and major literary forms and works from the Middle Ages to the end of the eighteenth century. Works by such writers as Chaucer, Spenser, Shakespeare, Milton, Pope, and Swift.

ENG 1121 Survey of English Literature II **4 Q.H.**

Surveys the major British writers and major literary movements from the romantic period through the Victorian and Modern periods to the present moment. Works by such writers as Wordsworth, Coleridge, Keats, Browning, Tennyson, Yeats, Lawrence, Lessing, and Beckett.

ENG 1123 Survey of American Literature I **4 Q.H.**

Surveys the major American writers and major literary forms and works from the colonial period to the Civil War. Works by such writers as Bradstreet, Taylor, Cooper, Poe, Hawthorne, Melville, and Emerson.

ENG 1124 Survey of American Literature II**4 Q.H.**

Surveys the major American writers and major literary forms and works from the Civil War to the mid-twentieth century. Works by such writers as Whitman, Dickinson, Twain, James, Hemingway, Fitzgerald, Faulkner and Wright.

ENG 1125 Technical Writing I**4 Q.H.***

Trains writers in the clear, unambiguous style of technical writing. Students practice these skills by writing technical proposals, process descriptions, feasibility and program reports, and operators' manuals. Includes oral presentations.

ENG 1126 Backgrounds in English and American Literature**4 Q.H.**

Examines translation of Greek, Roman, and biblical literature as background for literary study. Emphasis on the development of myth, genre, and theme. Readings include, among others, Homer, Virgil, Ovid, the most influential parts of the Bible, and Dante.

ENG 1275 Grammar for Journalists**4 Q.H.**

(Prereq. Journalism majors only)

Reviews the mechanics of newspaper and magazine prose. Emphasizes grammatical forms, punctuation, spelling, effective structures, and conventional usage.

ENG 1276 Science Fiction**4 Q.H.**

Traces the development of various SF themes and approaches, from early man-machine love-hate relationships to alien close encounters of all kinds. From *Frankenstein* to most recent titles. Major SF films. Lab fee.

ENG 1277 Topics in Science Fiction**4 Q.H.**

Focuses on a single writer or group of writers (Wells or writers of contemporary American science fiction); a theme (women in science fiction or the future city); or a unifying idea (time travel or utopia/dystopia).

ENG 1278 Modern Bestseller**4 Q.H.**

Explores the function of quest, romance, and adventure in a selection of contemporary, bestselling fiction.

ENG 1279 The Modern Novel**4 Q.H.**

Studies the major British and American novelists of the twentieth century. Considers theme and form in such authors as Lawrence, Woolf, Fitzgerald, Ellison, Doctorow, and Didion.

ENG 1280 Modern Drama**4 Q.H.**

Studies the development of drama from realism to surrealism, from Ibsen to Beckett.

ENG 1281 The Modern Short Story**4 Q.H.**

Studies the shortstory from Poe to the present, including such writers as Joyce and Kafka, Hemingway and Flannery O'Connor.

ENG 1283 Contemporary Fiction**4 Q.H.**

Examines British and American writers from 1945 to the present, including such figures as Lessing, Burgess, Pynchon and Barth. Emphasizes experimental and modernist authors.

ENG 1284 Business Tradition in Literature**4 Q.H.**

Examines the image of the business world as presented in novels and plays, biographies and autobiographies. Analyzes the cultural and historical contexts as well as the motives of the characters in society.

ENG 1285 Literature and the Law**4 Q.H.**

Investigates the problems of crime and justice as reflected in literature, from ancient to contemporary works. The secondary focus is the law itself as literature, including explorations of case files and other legal material. The readings encourage students to discover the changing nature of the criminals—heroes or victims or villains—and to deal with the social, psychological and political facts that define him or her.

ENG 1286 Literature and Politics**4 Q.H.**

Explores how authors from Sophocles to Mailer represent the religious, moral, and ethical conflicts arising from the acquisition, use, and misuse of political power. The literature falls into several categories: utopian, which establishes a conflict between the ideal and the real; satirical, which threatens a power structure by exposing it to scorn; analytic, which describes the rise to and fall from power of individuals, parties, or states; and investigative, which takes the reader inside a power elite to observe its inner operations. Examines the difference between the ideal of government and its reality.

ENG 1287 The Literature of Science**4 Q.H.**

Examines historically the discovery methods and models of literature and science, exploring one or more of the following areas: the relationship of the methods and models of literature and science; the treatment of scientific methods and models in literature; the use of literary devices, techniques, and traditions in scientific texts. Readings will be drawn from historically significant scientific texts, literary texts, or some combination of these. (VI)

ENG 1288 Film and Text**4 Q.H.***

Studies either the similarities and differences between literary texts and film versions of those texts or the interrelations between film and literature as means of cultural expression during a specific historical period. For example, the course might study Doctorow's *Book of Daniel* in relation to the film version, *Daniel*, or it might study books and movies of a period like the sixties that reflect the spirit of the era (*Catch-22*, *The Graduate*). Lab fee.

ENG 1289 Shakespeare on Film**4 Q.H.***

Examines the various treatments of Shakespeare's plays on film. Treats the technical aspects of film and how these are used by directors to transfer Shakespeare's plays from the stage to the screen. Lab fee.

*Lab fee required.

ENG 1290 Topics in Film**4 Q.H.***

Studies a theme or problem (film and society, film and politics), a period in film history (American film from 1945 to the present), a film genre (the western, film noire), or a film director (Hitchcock, Coppola). Lab fee.

ENG 1291 Popular Culture**4 Q.H.**

Television, film, the news media, advertising, rock music, popular magazines, romance novels, commercials, etc. The course studies the social meaning of the major artifacts of contemporary culture, from TV melodrama to clothing fashions. It situates culture within the system of social distinctions that derive from class hierarchies, and it analyzes the way a capitalist economic system shapes the values, ideals, and meanings that are disseminated in American popular culture.

ENG 1293 Topics in Popular Culture**4 Q.H.**

Focuses on such topics as the soap opera, the western, and the police story; on a popular culture activity; or on a popular culture perspective.

ENG 1294 Modern Film**4 Q.H.**

A selection of major modern films from around the world will be studied from a thematic, cultural, and historical perspective. Special attention is given to political, social, ethical, and psychological issues, as well as to the way common human themes emerge in quite diverse cultures. The course also covers the basic procedures of film interpretation.

ENG 1300 Topics in Fiction**4 Q.H.**

Studies a particular kind of fiction, such as the novella; a problem in fiction, such as the role of the narrator; a particular group of fiction writers; or a theme in fiction.

ENG 1301 Topics in Drama**4 Q.H.**

Studies a particular kind of drama, a particular group of dramatists, or a theme in drama.

ENG 1302 Topics in Poetry**4 Q.H.**

Studies a sub-genre of poetry, such as the sonnet or the dramatic monologue; a problem in poetry; a particular group of poets; or a theme in poetry.

ENG 1307 Approaches to Literature**4 Q.H.**

Examines ancient and modern theories of literature. Selections from the criticism of Plato, Aristotle and the Romantics, as well as from Marxist, Freudian, Jungian, and formalist theories.

ENG 1308 Myth and Archetype in Literature**4 Q.H.**

Studies twentieth-century theories of myth and archetype as they have influenced our understanding and analysis of works of literature.

ENG 1309 Topics in Literary Criticism**4 Q.H.**

Studies a specific problem method or school of criticism, such as structuralism, mythopoeic, or archetypal criticism.

ENG 1340 Writing Workshop**1 Q.H.***

(Prereq. Freshman English and 80 Q.H.)

Students will write one long paper, often in conjunction with an assigned paper in another course, that

will be produced in a class booklet at the end of the quarter. Emphasis is on the writing process: multiple drafts, revision, editing, and publication.

ENG 1350 Intermediate Writing**4 Q.H.***

Provides writing instruction in an interdisciplinary course in which students develop papers on topics relating to their majors. Led by English faculty, students will also read and respond to essays from various disciplines. Writing will be guided in stages from proposal through finished product.

ENG 1351 Creative Writing**4 Q.H.**

Gives the developing writer an opportunity to practice various forms of writing both poetry and prose. Features in-class discussion of student work.

ENG 1352 Advanced Writing**4 Q.H.**

(Prereq. ENG 1350 or permission of instructor)

Offers an opportunity for experienced writers to hone their skills, and develop their interests in different forms and subjects.

ENG 1357 Poetry Workshop**4 Q.H.**

(Prereq. ENG 1351 or permission of instructor)

Advanced workshop in writing and examining original student poetry. Students experiment in established poetic forms and compose their own work.

ENG 1358 Fiction Workshop**4 Q.H.**

(Prereq. ENG 1351 or permission of instructor)

Advanced workshop in writing and examining original student fiction.

ENG 1359 Non-Fiction Workshop**4 Q.H.**

(Prereq. ENG 1350 or ENG 1351 or permission of instructor)

Advanced workshop in writing with focus on such forms as short essays, reviews, and profiles.

ENG 1360 Topics in Writing: Reading and Writing**Non-Fiction****4 Q.H.**

Combines literary analysis and creative writing. Concentrates on subjects of twentieth-century non-fiction prose such as politics, science, "culture," athletics, and natural history. Authors who might be considered include: Elizabeth Drew, Russell Baker and Stephen Jay Gould.

ENG 1361 The Writing Process**4 Q.H.**

Explores the nature and activity of writing in theory and practice. Students observe writers at work and tutor students in the Writing Center as part of the course work.

ENG 1362 Publication Arts**4 Q.H.**

Acquaints students with basic publishing skills. Each student chooses an area of specialization, such as fiction, medicine, law, or engineering, in order to develop skill in editing manuscripts.

ENG 1370 Technical Writing II**4 Q.H.**

(Prereq. ENG 1125 or permission of instructor)

Offers an opportunity for students to develop technical writing skills in a particular subject or form.

* Lab fee required.

ENG 1371 Writing for the Computer Industry**4 Q.H.**

(Prereq. ENG 1125, or permission of instructor and one computer science course)

Focuses on computer documentation: general information, operating and programming instructions. Includes graphics, layout, testing, and revision.

ENG 1380 Writing for the Professions: Health Services**4 Q.H.**

Provides students in the College of Nursing and the College of Pharmacy and Allied Health Professions with instruction and practice in writing lab reports, clinical evaluations, medication analyses, HEW proposals, and other professional forms.

ENG 1381 Writing for Professions: Business Administration**4 Q.H.***

(Prereq. ENG 1111)

A professional writing course that relies on the process approach to writing and features an extended simulation, which integrates common written and oral communication through practical application. ENG 1381 allows students to gain experience similar to that of the workplace.

ENG 1382 Writing for the Professions: Criminal Justice**4 Q.H.**

Provides students in the College of Criminal Justice with instruction in writing a variety of professional forms.

ENG 1400 Topics in Genre**4 Q.H.**

Studies several genres concurrently; or studies, cross-generically, literary modes such as satire, pastoral, or melodrama; or studies a theme in a number of different genres.

ENG 1401 Introduction to Syntax**4 Q.H.**

Offers an introduction to syntax, the structural rules of a language. Develops and tests syntactic theory which, like other scientific theories, seeks to explain why things are the way they are. The question underlying the investigation is: how do the structures of language relate to the structure of the human mind?

ENG 1402 Grammars of English**4 Q.H.**

Provides a study of the rules of sentence construction in English, contrasting the traditional framework with current linguistic models. Students will have the opportunity to propose, postpose and extrapose as they learn to manipulate grammatical constructs.

ENG 1407 Introduction to Semantics**4 Q.H.**

Focuses on meaning and how it is expressed in language—through words, sentence structure, intonation, stress patterns and speech acts. How do content, logic, and speakers' and listeners' assumptions affect what sentences can mean? In what ways is linguistic meaning determined by our perceptual system or our culture?

ENG 1408 Topics in Linguistics**4 Q.H.**

Examines closely one of a range of topics from the perspective of current linguistics: American dialects,

language and law, women's and men's language, words and word structures, issues in linguistics and literature.

ENG 1409 American Novels I**4 Q.H.**

Focuses on the themes, forms, and techniques of major American novelists of the nineteenth and early twentieth centuries, such as Cooper, Hawthorne, Melville, Twain, and James.

ENG 1410 American Novels II**4 Q.H.**

Studies the modern and contemporary American novel. Considers such writers as Cather, Hemingway, Fitzgerald, Faulkner, Bellow and Baldwin. (III)

ENG 1411 English Drama I**4 Q.H.**

Surveys representative English drama, excluding Shakespeare, from *Everyman* to Goldsmith and Sheridan. Analyzes dramatic forms as well as the role of the Elizabethan theaters, dramatic conventions, audience content, and acting styles in Restoration farces.

ENG 1412 English Drama II**4 Q.H.**

Surveys representative English drama of the nineteenth and twentieth centuries. Charts the development of the genre from the nineteenth century to the present and discusses themes and forms.

ENG 1550 Psychology and the Novel**4 Q.H.**

Concentrates on twentieth-century novels and short stories which stress individual behavior and motivation and reveal human mental and emotional processes. Includes such writers as Kafka, Dostoevski, Faulkner, Conrad, and Lawrence.

ENG 1551 Sex Roles in Literature**4 Q.H.**

Investigates the relation between sex roles, male and female, and literary portrayals. Selections represent male and female writers and provide a culturally comparative perspective.

ENG 1552 Fantasy**4 Q.H.**

Studies in the theory and practice of fantasy as found in works of such writers as Swift, Carroll, C.S. Lewis, Orwell, and Tolkien.

ENG 1557 Topics in Fantasy**4 Q.H.**

Explores such areas as dreams, nightmares, and borderline states of consciousness in the works of such writers as Poe and Kafka.

ENG 1558 Literature in Context**4 Q.H.**

Attempts to place the writer in the context of a special theme. For example, the course might study a group of authors influenced by their common interest in psychoanalysis, by their social consciousness, or by an interest in the Wild West and the settlement of America.

ENG 1559 Literature in Context**4 Q.H.**

Similar to ENG 1558 but with different texts and contexts.

ENG 1600 Topics in Literature**4 Q.H.**

Experiments with subjects and themes such as the censored novel, the Holocaust, alienation, and popular song lyrics.

* Lab fee required.

ENG 1601 Topics in Literature 4 Q.H.

Same as ENG 1600 but with different topics.

ENG 1602 Major Figure 4 Q.H.

Examines in detail the work of one writer such as Mark Twain, Virginia Woolf, or Eugene O'Neill.

ENG 1607 Major Figure 4 Q.H.

Same as ENG 1602, but with concentration on a different writer.

ENG 1608 Urban Life and Literature 4 Q.H.

Examines the city in literature as it has been depicted from ancient times to the present, from Plato to Barthelme. Discusses such themes as the city as a locus of evil, the city as a place of possibility, and the city as a center of art and an influence on creative form in an interdisciplinary fashion.

ENG 1609 Contemporary American Literature 4 Q.H.

Studies major movements in American poetry and fiction since 1945. Considers such poets as Plath, Ginsberg, and Ashbery, and such novelists as Morrison, Pynchon, and Vonnegut.

ENG 1610 Early American Literature 4 Q.H.

Examines American literature of the colonial and federal periods, including Bradford, Taylor, Edwards, Franklin, Wheatley, Irving, and Bryant.

ENG 1611 New England Renaissance 4 Q.H.

Studies the development of a native tradition in the context of democratic and romantic attitudes toward experience and the paradox these attitudes reveal. Includes such writers as Emerson and Thoreau, Hawthorne and Melville.

ENG 1612 American Realism 4 Q.H.

Examines the realistic tradition in American literature, including local color and native humor, from the end of the Civil War to the turn of the century. Includes such writers as Twain, James, Howells, Crane, and Norris.

ENG 1617 Modern American Literature 4 Q.H.

Studies major developments in American poetry and fiction from 1900 to 1945. Considers such poets as Frost, Eliot, Stevens, and Moore, and such novelists as Hemingway, Faulkner, Fitzgerald, and Porter.

ENG 1618 Children's Literature 4 Q.H.

Studies the history of children's literature in the English language, with special attention to matters such as genre theory and critical approaches. Includes such works as *Alice in Wonderland*, *Uncle Remus*, *Little Women*, and *The Wizard of Oz*.

ENG 1619 Topics in Children's Literature 4 Q.H.

Focuses closely either on a specific collection of stories (*Grimm's Fairy Tales*), on a specific genre (boys' books), on a problem of evil, or on children's literature as a form of group socialization.

ENG 1620 Major Early British Novelists 4 Q.H.

Traces the development of the English novel from Defoe to Austen in light of new theories of narrative form, psychology, and "realism."

ENG 1621 Major Nineteenth-Century British Novelists 4 Q.H.

Studies theme and form in the major English novels of the nineteenth century, considering such authors as the Brontes, Charles Dickens, George Eliot, and Thomas Hardy.

ENG 1622 Major Twentieth-Century British Novelists 4 Q.H.

Introduces students to British fiction from Joseph Conrad to John Fowles, including such writers as D.H. Lawrence, Virginia Woolf, and others less well-known. The aim of the course is to show how novels as artistic creations shape their own worlds while helping us to understand ourselves.

ENG 1627 Medieval English Literature 4 Q.H.

Surveys the major works of medieval English literature. Works such as *Sir Gawain*, *Piers Plowman*, and *Pearl*.

ENG 1628 Chaucer 4 Q.H.

Surveys the work of Chaucer, with particular emphasis on the *Canterbury Tales*.

ENG 1629 Topics in Chaucer 4 Q.H.

Examines closely a particular work or group of works (such as *Troilus and Criseyde*) or a theme (such as Chaucer's symbolism).

ENG 1630 Milton 4 Q.H.

Concentrates on Milton's *Paradise Lost*, with supplementary readings in his minor poetry and prose.

ENG 1631 Topics in Medieval Literature 4 Q.H.

Focuses on such topics as a genre (romance or debate literature) or on a theme (alchemy or King Arthur).

ENG 1632 Sixteenth-Century Literature 4 Q.H.

Concentrates on sonnets, love lyrics, and erotic narrative poetry, principally by Wyatt, Sidney, Marlow, Spenser, and Shakespeare.

ENG 1637 Seventeenth-Century English Literature 4 Q.H.

Examines major writers of the period, such as Bacon and Jonson, Donne and Herbert, Milton and Dryden.

ENG 1638 Topics in Seventeenth-Century English Literature 4 Q.H.

Examines closely either a single writer or group of writers (congreve or the metaphysical poets) or a topic (the flourishing of satire).

ENG 1639 Eighteenth-Century English Literature 4 Q.H.

Surveys the Augustan age of comic masterpieces. Includes such major writers as Pope, Addison, Steele, Swift, Goldsmith, Burns, Johnson, and Boswell.

ENG 1640 Topics in Eighteenth-Century Literature 4 Q.H.

Examines closely such topics as a single writer or group of writers (Fielding or the essayists), a genre (satire) or a theme (reason and madness).

ENG 1641 Romantic Poetry 4 Q.H.

Surveys the development of English Romantic poetry, both in its lyric and longer forms, in Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. Emphasizes problems of belief and the relationship of the individual to the surrounding world of natural, social, and historical process. (V)

ENG 1642 Topics in Romantic Poetry 4 Q.H.

Examines closely a single writer or group of writers (the Keats-Shelley circles) or a theme (poetry and revolution or the creative process).

ENG 1647 Victorian Literature 4 Q.H.

Surveys the major issues and writers of Victorian England, considering such writers as Tennyson and Browning, Dickens and the Brontës, G.M. Hopkins and Oscar Wilde.

ENG 1648 Topics in Victorian Literature 4 Q.H.

Examines closely a single writer or group of writers (Arnold or the fantasists) or a theme (e.g., the movement toward modernism or decadence).

ENG 1649 World Literature I 4 Q.H.

Surveys world literature from the time of the Greeks through the Renaissance, from Homer to Cervantes.

ENG 1650 World Literature II 4 Q.H.

Surveys world literature from the Renaissance through the modern period, from Voltaire to Brecht.

ENG 1651 Masterpieces of World Literature 4 Q.H.

Studies "great books," primarily by non-English authors, that have been central to the development of Western thought and culture. Includes such writers as Homer, Dante, Montaigne, Goethe, and Proust.

ENG 1652 Twentieth-Century English Literature 4 Q.H.

Surveys the best and most interesting work of twentieth-century British writers such as William Butler Yeats, D.H. Lawrence, W.H. Auden, Doris Lessing, and Iris Murdoch.

ENG 1657 Topics in Twentieth-Century English Literature 4 Q.H.

Examines closely the work of a single author or group of authors (Lawrence or post-war authors) or a topic (forms of modernism or imperialism).

ENG 1658 Introduction to Shakespeare 4 Q.H.

Covers a selection of the major plays of Shakespeare, including both tragedies and comedies.

ENG 1659 Shakespeare's Comedies 4 Q.H.

Studies the romantic comedies, problem comedies, and romances, ranging from *The Merchant of Venice* to *The Tempest*.

ENG 1660 Shakespeare's Tragedies 4 Q.H.

Studies the nature of the tragic hero, the questioning of social norms, and the landscape of chaos, ranging from *Julius Caesar* to *Coriolanus*.

ENG 1661 Topics in Shakespeare 4 Q.H.

Examines closely such topics as the history plays,

Shakespeare in performance, the Shakespearean hero, and psychological approaches to Shakespeare.

ENG 1662 The Bible 4 Q.H.

Studies books of both the Old Testament and the New Testament as literature and as history.

ENG 1667 Modern Poetry 4 Q.H.

Studies modernist tradition in American and British poetry. Considers such writers as Yeats, Hardy, Frost, Eliot, Stevens, Pound, Williams, and Cummings. (III)

ENG 1668 Topics in Modern Poetry 4 Q.H.

Focuses on a particular theme such as the poet's use of the past, his or her role in politics, a particular problem in modern poetry, or a particular group of modern poets.

ENG 1669 Studies in English Literature I 4 Q.H.

A seminar on a special topic in English literature, such as color symbolism in literature or John Donne and the metaphysical poets.

ENG 1670 Studies in English Literature II 4 Q.H.

Same as ENG 1669 but with different topics.

ENG 1671 Studies in American Literature I 4 Q.H.

Studies a special topic in American literature, such as the genteel tradition of American humor.

ENG 1672 Studies in American Literature II 4 Q.H.

Same as ENG 1671 but with different topics.

ENG 1677 Contemporary Poetry 4 Q.H.

Studies developments in British and American poetry since 1945. Includes such writers as Plath, Ginsberg, Lowell, Bly, Ashbery, and Heaney. (VI)

ENG 1678 Early African-American Literature 4 Q.H.

A survey of the development and range of black American writers, emphasizing poetry and prose from the post-Civil War period to the present.

ENG 1679 Modern African-American Literature 4 Q.H.

A continuation of ENG 1678.

ENG 1690, ENG 1691 Junior-Senior Seminar (each) 4 Q.H.

(First preference given to students needing the course to complete the major.) Explores an important aspect of literature such as the writer and the audience, the tradition of the new, style and meaning, and the jazz age. Emphasizes independent research in a seminar setting.

ENG 1800, ENG 1801 Freshman English for Honors Students (each) 4 Q.H.

(Prereq. Special placement)
Equivalent of ENG 1110 and ENG 1111 for Honors Program freshmen. Meets during winter and spring terms so that both science and non-science majors in the Honors Program can enroll together. See English Department course listing under ENG 1110, ENG 1111 for description.

ENG 1802, ENG 1803, ENG 1804, ENG 1805
Junior-Senior Honors Program (each) 4 Q.H.
 For details contact the Honors Office, 183 Holmes.

ENG 1806 English Adjunct Mini-Course 1 Q.H.
 For details contact the Honors Office.

ENG 1810, ENG 1811 Directed Study (each) 4 Q.H.

Film

Courses in film are offered in the following departments.

Art: ART 1170 Filmmaking Workshop

ART 1171 Animation Workshop

ART 1233 Contemporary Directions in Photography

ART 1235 History of Film

ART 1236 The American Film

ART 1238 Documentary Film

ART 1800 Directed Study

English: ENG 1288 Film and Text

ENG 1289 Shakespeare on Film

ENG 1290 Topics in Film

ENG 1291 Popular Culture

ENG 1294 Modern Film

History: HST 1494 History and Film

Modern Language: LNF 1321 French Film

Masterpieces

LNF 1550 Introductory Film

Analysis

LNF 1551 Film Theory

LNF 1560 Film and Psychoanalysis

LNF 1550 Spanish Film

Masterpieces

Speech Communications: SPC 1450 Television I

These courses are described in departments to which they belong. For information on the Film Studies Minor, see the section on Interdisciplinary Minors at the beginning of the *Curriculum Guide*, or call the Office of the Film Studies at 437-5163.

Geology

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office before taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on page 1-2.

GEO 1119 Marine Resources 4 Q.H.

The course provides a qualitative and quantitative survey of renewable and nonrenewable resources from the sea. Aspects covered include offshore oil and gas utilization, marine minerals, and tidal power; coastal zone recreational resources, including polluted beaches and artificial fishing reefs.

GEO 1120 Physical Oceanography 4 Q.H.

The course provides a description of the physical properties and composition of sea water, waves, tides, and ocean currents. The course discusses how these properties are measured by oceanographers and how they influence the earth's environment and climate.

GEO 1121 Biological Oceanography 4 Q.H.*

Topics include the productivity of animal and plant life in the various zones of the ocean; the growing economic importance of the oceans as a source of food for the expanding world population.

GEO 1128 Geological Oceanography 4 Q.H.

In this course the form of the ocean basins and their margins is related to the major processes forming them. Emphasis is placed on local landforms, including New England beaches, spits, barrier islands, and the continental shelf.

* Lab fee required.

GEO 1140 Environmental Geology 4 Q.H.

The course discusses how geologic processes acting at the earth's surface interact with the human environment. Topics include river and ocean flooding, coastal erosion, landslides, land-use planning, and waste disposal.

GEO 1141 Geological Hazards and Resources 4 Q.H.

The course discusses how geologic processes originating deep inside the earth interact with the human environment. Topics include global crystal movements, volcanic and earthquake hazards, mineral resources, coal and oil, geothermal energy, resource management, and disposal of radioactive wastes.

GEO 1154 Planetary Astronomy 4 Q.H.

This course focuses on astronomy of the solar system. Topics include description of the planets and other objects with discussion of how our understanding has evolved from the days of naked-eye observation to the present era of interplanetary probes.

GEO 1156 Observational Astronomy 5 Q.H.

An introduction to systematic observation of the night sky, this course emphasizes observation and description of the patterns and motions of celestial bodies as seen with the unaided eye. Nightly viewing sessions required; supplemented by training sessions in the planetarium.

GEO 1210 North America and the Ice Age 4 Q.H.

This course focuses on description and history of ice-sheets that have advanced and retreated across the northern U.S.A. and Canada during the last three million years. Topics include evidence of past climatic change and predictions of future change, fluctuating sea levels, and the impact of these changes on man and the environment.

GEO 1212 Physical Geology 4 Q.H.

The course offers a systematic study of the materials comprising the earth. Topics emphasized include the processes by which rock is formed, transported, altered, and destroyed, as well as the nature and development of landscape. (II)

GEO 1213 Physical Geology Laboratory 1 Q.H.
(Prereq. GEO 1212; may be taken concurrently)

Optional laboratory for GEO 1212, Physical Geology. Laboratory exercises pertain to mineral and rock identification and topographic and geologic map interpretation. Required for geology majors.

GEO 1222 Historical Geology 4 Q.H.

The physical and biological history of the earth is traced through geologic time. Major topics are the origin and evolution of life, mountain building, and continental drift. (II)

GEO 1223 Historical Geology Laboratory 1 Q.H.
(Prereq. GEO 1222; may be taken concurrently)

Course offers a study of fossil representatives of major invertebrate phyla, application of fossils to

studies of rock sequences, interpretation of geologic history from geologic maps and sedimentary rocks.

GEO 1250 Advanced General Geology 4 Q.H.
(Prereq. GEO 1212 and GEO 1222)

The course offers an introduction to new and advanced concepts, theories, and hypotheses in geology. Students participate actively in discussions, research papers, and individual projects.

GEO 1305 Rock Identification Laboratory 1 Q.H.
(Prereq. GEO 1310; may be taken concurrently)

The course provides self-paced laboratory exercises in the identification and classification of common rocks.

GEO 1310 Descriptive Mineralogy 5 Q.H.
(Prereq. Two quarters of chemistry)

The course provides a study of mineralogy, including crystallography and physical, chemical, and descriptive mineralogy of the common rock-forming minerals.

GEO 1311 Optical Crystallography 5 Q.H.
(Prereq. GEO 1310)

The theory and the practical methods of optical crystallography are studied, including the basic techniques for determining the optical constants of crystals using the polarizing microscope and immersion media.

GEO 1312 Petrography 5 Q.H.
(Prereq. GEO 1311)

Topics include description and identification of rocks and rock-forming minerals using thin-sections and the petrographic microscope; discussion of textural and mineralogic relationships.

GEO 1320 Field Geology 4 Q.H.
(Prereq. GEO 1212)

The course focuses on field techniques as a working guide for the approach, pursuit, and solution of geologic problems. Among the techniques considered are geologic map construction, stratigraphic section measurement, and field rock description. The laboratory consists of field research at a quarry, roadcut, or other geologic exposure.

GEO 1412 Geochemistry 4 Q.H.
(Prereq. One year of chemistry)

The course offers an evaluation of chemical processes important in the various geologic environments and their effects on the development of the lithosphere.

GEO 1414 Igneous and Metamorphic Petrology 5 Q.H.
(Prereq. GEO 1312)

The course covers the origin and distribution of igneous and metamorphic rocks as interpreted from their chemistry, mineralogy, and field relationships. Laboratory includes field and petrographic analysis of rock suites.

GEO 1416 Economic Geology 4 Q.H.
(Prereq. Dept. approval)

The course focuses on the genesis, associations, and occurrence of the major ore minerals, illustrated

by studies of selected ore bodies of various types throughout the world.

GEO 1418 Structural Geology **5 Q.H.**
(Prereq. GEO 1212 and GEO 1213)

Description and origin of large- and small-scale rock structures with emphasis on interpretation of the mechanics of deformation. Field and laboratory analyses of structural problems using maps, models, and rock specimens.

GEO 1420 Geophysics **4 Q.H.**
(Prereq. PHY 1231)

This course offers a study of basic techniques of reflection and refraction seismology, gravity, aeromagnetic, and heat-flow techniques and the information they provide on the structure, composition, and dynamics of the earth's interior. Emphasis is placed on the application of these techniques to the search for economic minerals in the earth's crust.

GEO 1424 Stratigraphy **5 Q.H.**
(Prereq. GEO 1222)

Course offers study of paleoenvironments and sedimentary-basin analysis based on sedimentary structures, stratigraphic sequences, and fossils. Emphasis is on use of geologic sections, drill-cores, and well-logs. Laboratory interpretation of sedimentary rock suites, maps, and sections.

GEO 1428 Invertebrate Paleontology **5 Q.H.**
(Prereq. GEO 1222)

Survey of the major invertebrate phyla preserved in the fossil record. Micro- and macro-evolutionary principles are discussed with consideration of adaptive and functional morphology and the role of paleoenvironments. Laboratory involves description and classification of fossil invertebrates.

GEO 1430 Sedimentation and Sedimentary Environments **5 Q.H.**

The course offers a description of the physical processes of sedimentation and their role in the interpretation of modern and ancient sedimentary environments. Laboratory concentrates on the interpretation and description of the physical and textural properties of sediments and sedimentary rocks.

GEO 1432 Sedimentary Petrology **5 Q.H.**
(Prereq. GEO 1311)

Topics include origin, classification, and petrography of the major groups of sedimentary rocks. Discussion of the environments of deposition of the nonclastic rocks. Laboratory concentrates on thin-section study of sedimentary rocks.

GEO 1434 Coastal Processes **4 Q.H.**
(Prereq. GEO 1212)

The course examines the effect of coastal marine processes and the resultant coastal responses. Topics include the dynamics of waves and currents and the associated erosion, transportation, and deposition of sediment, forming beaches, barrier islands, and cliffed structures.

GEO 1436 Marine Geology **4 Q.H.**
(Prereq. GEO 1212)

The balance between major sedimentary and tectonic forces in ocean basins and margins is compared to resulting ocean form. Topics include origin of continental shelves, shelf sedimentation and transport, deep-sea processes and sediments. Resource development of OCS oil, sand and gravel, and manganese nodules is evaluated.

GEO 1440 Geomorphology **4 Q.H.**
(Prereq. GEO 1212)

The course focuses on the origin and evolution of landscape features by processes operating at or near the earth's surface.

GEO 1444 Glacial and Pleistocene Geology **4 Q.H.**
(Prereq. GEO 1222)

The course covers the processes of ice movement and the characteristics and distribution of erosional and depositional structures associated with past and present glaciers; introduction to Pleistocene chronology and correlations.

GEO 1450 Geology Seminar **4 Q.H.**
(Prereq. Major in geology or senior status)

The course offers in-depth study, on an individual or small-group basis, of a selected geologic topic. Both oral and written presentations are required.

GEO 1816, GEO 1817 Undergraduate Research **(each) 4 Q.H.**

The course offers independent research on a selected topic under the direct supervision of a faculty member. Open only to juniors and seniors majoring in geology, with the recommendation of the supervising faculty member and of the department.

GEO 1820, GEO 1821 Directed Study **(each) 4 Q.H.**

The course offers independent study of a specific topic not normally contained in the regular course offerings, but within the area of competence of a faculty member. Open to all students with the recommendation of a faculty member and departmental approval.

GEO 1824, GEO 1825 Special Studies **(each) 1 Q.H.**

The course offers an independent study of a specific topic. Open to all students with the recommendation of a faculty member and departmental approval.

GEO 1830, GEO 1831, GEO 1832, GEO 1833 Junior-Senior Honors Program **(each) 4 Q.H.**
For details contact the Honors Office, 183 Holmes.

INT 1215 Into the Ocean World **4 Q.H.**

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a

commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but when appropriate, we will focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1216 A History of Seafaring 4 Q.H.

This course surveys maritime transportation, trade, travel, exploration, and warfare from approximately 3500 B.C. to the end of the wooden boat era in the late nineteenth century. Prior to the widespread application of steam power on land and sea in the nineteenth century, ships were the fastest, safest, and most economical means of transporting large cargoes over long distances. Literary and art history sources are also introduced, along with several films on maritime archaeology.

INT 1217 Water, Water 4 Q.H.

This course is an interdisciplinary introduction to our most precious resource. Water has affected our bodies, our planet, our history, and our culture. How

we manage it will shape our future. Because of increasing demand, waste, and pollution, we are depleting — and risk destroying — the limited supply of usable fresh water. This course will look at water through scientific, historical, and cultural viewpoints, and survey contemporary water problems in all their dimensions — political, economic, and technological. (VI)

INT 1320 Exploring the Humanities Through Film 4 Q.H.

The purpose of this interdisciplinary course is to investigate the ways in which the methods of the humanities can expand one's awareness of the sources, statements, and meanings of popular films. Students will see a series of movies and will analyze and evaluate them in the light of readings, the various approaches presented by faculty members from a number of humanistic disciplines, and their own experience.

History

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

HST 1101 Western Civilization 4 Q.H.

This course explores the major ideas and institutions of Western Civilization from ancient times to 1648. (II)

HST 1102 Western Civilization 4 Q.H.

A continuation of HST 1101, covering the period since 1648. (II)

HST 1111 Advanced Western Civilization 4 Q.H.

(Prereq. Invitation of instructor of HST 1101)

Students who demonstrate mastery of HST 1101 through consistently superior work may be invited to work on an individual basis with their instructor. Together they will work out projects relating to the course. (II)

HST 1112 Advanced Western Civilization 4 Q.H.

(Prereq. Invitation of instructor of HST 1102)

Similar to HST 1111 in relation to HST 1101. (II)

HST 1113 Honors Western Civilization 4 Q.H.

Honors Western Civilization is for students invited to participate in the freshman honors program. Coverage is similar to HST 1101. (II)

HST 1114 Honors Western Civilization 4 Q.H.

Honors Western Civilization is for students invited to participate in the freshman honors program. Coverage is similar to HST 1102. (II)

HST 1150 Introduction to Third World History (Group D) 4 Q.H.

A survey of the history of the leading nations in Asia

and Africa from early civilizations through twentieth-century independence movements and international relations.

HST 1201 The United States to 1877 4 Q.H.

The course focuses on the history of the American people from 1763 to 1877, with an analysis of the American Revolution and the major political, constitutional, diplomatic, economic, and social problems of the new nation. (II)

HST 1202 The United States since 1877 4 Q.H.

The course offers a continuation of the survey of American history, with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government. (II)

HST 1241 The Historian's Craft 4 Q.H.

The ways in which the historian studies the past and the nature of historical statements are examined. Problems considered include research techniques, changing conceptions of historical knowledge, and the relation between the historian and the society in which he works. (II)

HST 1251 Social Science Methodology 4 Q.H.

The course offers an introduction to social science methodology and quantitative techniques used in historical analysis.

HST 1311 Ancient Greece (Group A) 4 Q.H.

Topics include the origins and development of Greek civilization; political evolution of Hellenic society from

tribal to city-state organization; growth and application of Greek religious, political, and ethical ideas. (III)

HST 1315 Ancient Rome (Group A) 4 Q.H.

This course examines Roman civilization in two sequences: the rise of Roman power under the Republic and the decline of Roman power under the Empire.

HST 1321 Medieval Europe (Group A) 4 Q.H.

Topics include Europe from the barbarian invasions to the late thirteenth century; the expansion of Christianity and the institutionalization of church and papacy; the emergence of the Holy Roman Empire, England, and France as political units; social, cultural, and economic developments.

HST 1331 Europe in the Age of the Renaissance (Group A) 4 Q.H.

The course focuses on Europe from 1300 to 1500, when alternatives to medieval institutions became increasingly apparent. Special attention to political, economic, and cultural changes in Italy and northern Europe. (III)

HST 1336 Luther and His Age (Group A) 4 Q.H.

A study of Martin Luther, John Calvin, Henry VIII, Elizabeth I, and their political and religious contemporaries who between 1500 and 1650 overthrew the church's monopoly of religion, forged new relationships between princes and subjects, found new ways to create wealth, challenged the traditional roles of men and women in families and communities, and created new attitudes toward national and international politics.

HST 1351 England to 1688 (Group A) 4 Q.H.

Topics include prehistoric Britain, the Anglo-Saxons, the Normans, the Plantagenets, the Tudors, and the Stuarts, with emphasis on the development of parliamentary institutions until the Glorious Revolution.

HST 1355 Tudor England (Group A) 4 Q.H.

This course offers a study of England from the late fifteenth to the early seventeenth century. Topics include an examination of the Tudor contribution to the development of political and social institutions; the Protestant Reformation and the relation between religion and politics; social and economic changes and their relation to the Elizabethan Renaissance. Particular emphasis is placed on intellectual and cultural developments and England's relation to Europe and the New World.

HST 1358 Stuart England (Group A) 4 Q.H.

Seventeenth-century England, from the reign of James I. Topics include the social, economic, and political backgrounds of the English Civil Wars or Puritan Revolution; the age of Cromwell; the restoration of the Stuarts; the Glorious Revolution; and the end of the Stuart dynasty. Seventeenth-century sources and literature will be used in addition to modern texts.

HST 1390 Population in European History (Group A or B) 4 Q.H.

This course provides an application of the principles of demography to European history from Roman times

to the present, with attention to the interaction of birth, death, marriage, and migration rates with climate change, epidemic disease, war, economic developments, social upheaval, and political policy.

HST 1391 European Urban History to 1850 (Group A or B) 4 Q.H.

A review of urban development from the Greeks through the emergence of the industrial cities of nineteenth-century Europe. Individual cities such as Rome, Paris, and London are given special study.

HST 1392 Women In European History to 1815 (Group A or B) 4 Q.H.

This course offers an examination of changing sex roles from the early Christian era through the eighteenth century and an assessment of their significance within the social and political context of pre-industrial Europe. Topics include society's attitudes toward the sexes; family structure and marriage patterns; and male and female roles in economic life and in religious and political movements.

HST 1393 History of Science and Technology (Group A or B) 4 Q.H.

The course offers an interdisciplinary survey of the development of science and technology, integrating theories of the philosophy and sociology of science within a historical framework. Emphasis is placed on the environmental and ideological conditions that contribute to the birth and growth of the various sciences and to the relation between these conditions and technological innovation.

HST 1394 Revolutions (Group A or B) 4 Q.H.

This course provides a review of the important theories of revolution and an analysis of the major early modern and modern revolutions, with a view to evolving a working theory of both political and generational revolutions for the twentieth century.

HST 1395 History of Flight and Space Travel (Group A, B, or C) 4 Q.H.

Beginning with the dreams of flight of the ancient Greeks and Leonardo da Vinci, the course traces the history of nonpowered flight from the balloon experiments of the Montgolfier brothers to contemporary hang gliders; powered flight from the Wright brothers to the SST; and rocketry and space travel from its earliest beginnings to "Enterprise."

HST 1397 Health and Sickness: Historical Perspectives (Group A, B, C, or D) 4 Q.H.

A survey of medical theories and the health care systems derived from them, from ancient times to the present. Medical theory and practice as related both to the general history of the time and to the particular political, economic, or social circumstances that influenced institutions for health care.

HST 1407 Europe, 1870-1921 (Group B) 4 Q.H.

The course focuses on Europe from the Franco-Prussian War to the post-World War I settlement: the growing tensions and rivalries and the declining certainties of the end of the nineteenth century, the origins of World War I, the War itself, the Russian Revolution, and the Peace of Paris.

HST 1408 Europe since 1921 (Group B) 4 Q.H.

The course focuses on Europe from the Versailles Settlement: the rise of totalitarianism, the Depression, the crises of liberalism and of the European mind, the Appeasement Era, World War II, the Cold War, the end of colonialism, and Europe today.

HST 1421 England since 1688 (Group B) 4 Q.H.

The course focuses on England from the Glorious Revolution to the present, with emphasis on the development of Parliament, the Industrial Revolution, nineteenth-century reaction and reform, the World Wars, and the rise of socialism.

HST 1424 Victorian England (Group B) 4 Q.H.

The economic, social, and political life of the English people during Victoria's reign. (IV)

HST 1425 The Decline of Great Britain (Group B) 4 Q.H.

The economic, social, and political life of the English people in the twentieth century. (IV)

HST 1428 Irish Civilization (Group B) 4 Q.H.

The course examines the history of Irish civilization from the earliest hero sagas and their impact on Irish values to the Irish independence movement, the prototype and model for many other twentieth-century liberation movements. (IV)

HST 1433 The French Revolution and Napoleon (Group B) 4 Q.H.

The course examines the history of France in the age of the *ancien régime* and the Enlightenment as background for the French Revolution and Napoleon.

HST 1434 Modern France (Group B) 4 Q.H.

A survey of the chief political, social, economic, intellectual, and cultural developments of France from the Revolution to the present. (IV)

HST 1435 History of Modern Italy (Group B) 4 Q.H.

The course offers a survey of the social, economic, and political development of the modern Italian state from the seventeenth century to the present. Emphasis on the problem of modernization.

HST 1441 Hitler's Germany (Group B) 4 Q.H.

This course offers a study of the origins and nature of Hitler's Third Reich, emphasizing the personal lives of Nazi leaders in an attempt to understand how seemingly ordinary people could enthusiastically promote wars of aggression and revel in genocidal policies.

HST 1451 Imperial Russia (Group B) 4 Q.H.

The course focuses on the emergence of Russia as a recognized European power, westernization and expansion in the eighteenth century, the impact of Napoleon, reform and revolution.

HST 1452 Soviet Russia (Group B) 4 Q.H.

The course examines forces molding the history of Russia since 1917, internal developments, and foreign relations. (IV)

HST 1461 Imperialism (Group B) 4 Q.H.

The course examines the rise and fall of the European colonial empires with an emphasis on the period of the late eighteenth to the twentieth century. Attention is given to theories underlying imperial expansion and the impact of imperialism on colonies and colonizers. (III)

HST 1471 Class, Love, and Power in Western Europe (Group B) 4 Q.H.

The course provides an examination of social change in Europe since 1800 with emphasis on the interaction of industrialization, class movements, demographic trends, and revolutionary upheavals.

HST 1472 The Family In European History (Group B) 4 Q.H.

The course offers an examination of issues in the history of the European family from the late Middle Ages to the present. Topics include marriage and sexuality, child-rearing practices, the effect of industrialization and revolution on family life, the Victorian family, and the evolution of the modern family. Students will prepare their own family histories.

HST 1473 Women in Modern Europe (Group B) 4 Q.H.

Examines the situation of women in Western Europe from the French Revolution to the 1950s, focusing on France, Britain, and Germany. Topics explored include: women in revolutionary movements, the impact of industrialization on women and the family, women in the labor movements, the struggle for suffrage, and the effects of world wars on women.

HST 1481 The Culture of Europe (Group B) 4 Q.H.

The course provides an analysis of the culture of the West in the nineteenth and twentieth centuries, focusing on the conjunction of social, cultural, and psychological forces that encouraged or retarded creativity. Attempts will be made to show the interconnections among the arts, social sciences, and sciences within each of the periods covered. (III)

HST 1485 Communism and Revolution (Group B) 4 Q.H.

The course focuses on the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

HST 1491 Modern Western Economic History (Group B or C) 4 Q.H.

The course provides a survey of the development of the Western world examined within the framework of economic theory, with attention to social and political ramifications. (III)

HST 1492 Capitalists and Capitalism (Group B or C) 4 Q.H.

This course provides an examination of capitalism from the Renaissance to the present with attention to the role of major individual capitalists such as the Rothschilds, Krupps, and Rockefellers, and to the

impact of great historical forces such as war, the Protestant Reformation, and imperialism.

HST 1493 Work and Leisure (Group B or C)

4 Q.H.

How we work and how we play are important determinants of how we live. This course examines the historical evolution of contemporary patterns of work and leisure across cultural, sexual, and class lines. Subjects include the impact of machine technology on the worker and the workplace; workers' organizing in unions and professional groups; changing concepts of the use of time; women's work and women's leisure; recreation and sports (both participant and spectator); and the rise of the café and the saloon as sociable institutions. (III)

HST 1494 History and Film (Group B or C)

4 Q.H.

The course offers an exploration of various historical issues as seen through the eyes of historians and filmmakers. Both acted and documentary films are shown in combination with readings from a variety of source and interpretive materials.

HST 1495 Technological Transformations of Society (Groups B, C, or D)

4 Q.H.

The relation between technological innovations and the world in which they take place. Discussion of conditions necessary for discovery and innovation. Impact of technology on political, economic, and social environments.

HST 1496 War In the Twentieth Century

(Group B, C, or D)

4 Q.H.

The course provides an analysis of the causes, prosecutions, and effects of the major wars fought in the twentieth century. The course concentrates on the First and Second World Wars and on the Vietnam War. Using film, simulations, and other materials, classes explore the economic, social, cultural, and psychological impacts of these wars as well as their political, diplomatic, and material aspects.

HST 1497 The World since 1945 (Group B)

4 Q.H.

The course offers a thematic study of issues and movements that have influenced the world's history since the end of the Second World War. Subjects include the Cold War, the end of colonialism, urbanization, technology and ecology, cultures and counter-cultures, the "global village," and the prospect for human liberation.

HST 1501 Topics in American History

(Group C)

4 Q.H.

Special topics in the history of the people of the United States from 1789 to the present.

HST 1510 Colonial America (Group C)

4 Q.H.

The course covers the discovery and exploration of the New World, the settlement of the English colonies on the North American mainland, their development to 1763, and the origin of their clash with England. (III)

HST 1511 The American Revolution (Group C)

4 Q.H.

The course focuses on the coming of the American Revolution, its nature and progress, and its political, economic, and social aftermath.

HST 1514 The Civil War and Reconstruction (Group C)

4 Q.H.

The course focuses on the Civil War, its coming, its nature and progress, and the aftermath of Reconstruction.

HST 1516 The United States, 1898–1939

(Group C)

4 Q.H.

Social, economic, political, and diplomatic changes from the Progressive Era through the Great Depression and the New Deal.

HST 1517 The United States, 1939–1960

(Group C)

4 Q.H.

Social, economic, political, and diplomatic changes from the start of World War II to the election of John F. Kennedy.

HST 1518 The United States since 1960

(Group C)

4 Q.H.

Social, economic, political, and diplomatic changes in the United States since 1960.

HST 1525 African-American History (Group C)

4 Q.H.

An in-depth examination of the major topics that have shaped the African-American experience. Among the areas to be included are slavery and its effects, the role of the antebellum free black, the Civil War and Reconstruction, black response to the new racism of the late nineteenth century, the W.E.B. DuBois-Booker T. Washington controversy; Marcus Garvey and the shaping of twentieth-century black nationalism, and the changing nature of the black revolution from Martin Luther King to Malcolm X and beyond. (III)

HST 1527 Total Institution and the Individual: An Interdisciplinary Approach (Group C)

4 Q.H.

Using the tools of history, psychology, and sociology, this course examines the varying effects that total institutions (such as prisons, asylums, concentration camps, and the American slave plantation) have had on the human personality. An effort is made to develop a clearer understanding of how the human personality responds to such environments and of their stigmatic effects on the individual.

HST 1528 Crime and Punishment: A History of the Criminal Justice System in America

(Group C)

4 Q.H.

The course examines the evolution of the criminal justice system in the United States, with special emphasis on the impact of English common law, the changing role of law enforcement officers, reform movements, the female offender, the black experience, and the changing meaning of law and order in the United States.

HST 1531 The Industrial Transformation of New England (Group C) 4 Q.H.

This course examines the process by which New England evolved from an agricultural to an industrial society and the effects of industry's move from the area. Field trips to historical industrial sites are planned.

HST 1532 History of Massachusetts (Group C) 4 Q.H.

This course focuses on the political, economic, social, and intellectual history of Massachusetts from the Constitution of 1780 to the present. The impact of war, immigration, and industrialization, and the orientation and integration of Massachusetts in the Union are studied.

HST 1533 History of Boston (Group C) 4 Q.H.

The history of Boston from colonial times to the present, with attention to the topographical growth and the ethnic composition of the city.

HST 1541 The Westward Movement (Group C) 4 Q.H.

The course examines America's westward movement and its impact on the political, social, and economic life of the nation.

HST 1543 American Urban History (Group C) 4 Q.H.

The course examines the development of urban society in the United States in the nineteenth and twentieth centuries, with emphasis on the effects of immigration and industrialization upon the politics, thought, and society of American cities.

HST 1552 American Reformers and Reform Movements (Group C) 4 Q.H.

The course provides an analysis of American reform, especially in the nineteenth century.

HST 1554 Women in America (Group C) 4 Q.H.

An analysis of women's economic and social roles from the colonial period to the present is offered in this course, with special attention to women's work, their roles in family and community, and nineteenth- and twentieth-century women's rights movements. (III)

HST 1555 American Elites (Group C) 4 Q.H.

This course examines the life of elite individuals and groups in American society, especially in the nineteenth and twentieth centuries.

HST 1563 History of Sport in America (Group C) 4 Q.H.

The course provides a history of the major sports and their impact on American life.

HST 1571 American Business History (Group C) 4 Q.H.

The course examines the rise of business in America, the role of the corporation, horizontal and vertical combinations, business and labor, business and government.

HST 1572 History of the Professions (Group C) 4 Q.H.

The course examines the evolution of the classic professions of law and medicine in the nineteenth century and the emergence of new professions in engineering, nursing, accounting, and social work. Themes include professional-client, professional-employer, and professional-governmental relations as well as education, professional organizations, and sex-stereotyping.

HST 1575 History of Media in America (Group C) 4 Q.H.

The course focuses on mass communication in American history, with attention to the role of books, newspapers, magazines, films, radio, and television.

HST 1577 America and the Sea (Group C) 4 Q.H.

Topics include the history of exploration and discovery of America, the development of fishing, the rise of ocean commerce, the history of the American Navy.

HST 1578 The Automobile In America (Group C) 4 Q.H.

The course focuses on the impact of the automobile on American society in a historical context. Topics include inquiry into the abandonment of traditional prohibitions of motorized carriages and examination of the use of planning, taxes, and highway policies to foster the use of the automobile. The effect of the car on land use, recreation, and the economy. Contemporary issues such as pollution and energy.

HST 1581 The Growth of American Government to 1935 (Group C) 4 Q.H.

Examines the expansion of government from the late nineteenth century to the Great Depression of the 1930s, focusing on the growth of the federal government, the presidency from Cleveland to Roosevelt, and new public policies.

HST 1582 The Growth of Government since 1935 (Group C) 4 Q.H.

Examines the expansion of government from Roosevelt to the present, focusing on the reasons for the growth and its consequences, the development of major public policies, and the transformation of the federal role and politics.

HST 1585 American Diplomatic History (Group C) 4 Q.H.

The course focuses on the formation and administration of American foreign policy from the Revolution to the present.

HST 1586 American Military History (Group C) 4 Q.H.

A survey of the complex relation between American society and war, from the age of muskets to the neutron bomb.

HST 1591 China and the United States (Group C or D) 4 Q.H.

The course offers an examination of the relations of China and the United States, including the period of

the missionaries and opium traders; the era of special privileges; the Open Door policy; the first half of the twentieth century, when China became America's favorite protégé; and the years of strain, warfare, and finally accommodation after the Chinese communists came to power in 1949.

HST 1592 History of the Vietnam Wars

(Group C or D)

4 Q.H.

A history of military conflict in Vietnam with attention to the rise of the Viet Minh during World War II, the struggle against the French in the first Indochina war, the impact of the Cold War, and the involvement of the United States after 1950 in Laos and Cambodia as well as Vietnam. Emphasis will be placed on the roles of communism and nationalism in Indochina and on the motives for American intervention. Films revealing American reaction to the escalating conflict will be shown.

HST 1601 Canadian History (Group D)

4 Q.H.

The history of Canada from the time of European settlement to the present, with emphasis on Canadian relations with the United States and on the background of the Quebec separatist movement. (IV)

HST 1604 Modern Latin America (Group D)

4 Q.H.

Latin America from the mid-nineteenth century to the present; dictatorial republics and the continuation of poverty and injustice; the struggles toward democracy; the rise of nationalism; the threat of communism; the relations between the United States and Latin America.

HST 1605 The Modern Caribbean (Group D)

4 Q.H.

Topics include the successful Haitian revolt against slavery, peasant movements after the abolition of slavery, the Marcus Garvey movement, Caribbean music and art, the Cuban revolution, Black Power, and American interventions in the Caribbean from the Spanish-American War to Grenada. This course is the same as AFR 1297.

HST 1612 The Modern Middle East (Group D)

4 Q.H.

Focus of this course is on the Middle East since 1800, with emphasis on the background of present problems. (VI)

HST 1613 Contemporary Middle East (Group D)

4 Q.H.

The course focuses on political, economic, and social developments in the Middle East since the end of World War II.

HST 1614 The Middle East Today In Fact, Fiction, and Film (Group D)

4 Q.H.

A study of social, economic, and political changes and conflict in the lives of ordinary people who have been experiencing the recent crises reported in the media. The course will focus on common experiences among various peoples—Turks, Armenians,

Israelis, Arabs, and Iranians—and will emphasize significant themes: lifestyles, generational conflict, the changing role of women, ethnic or ideological conflict, and the prevalence of identity crises attending cultural and social disruption.

HST 1621 Modern African Civilization (Group D)

4 Q.H.

An introduction to modern Africa in the years from 1800 to 1960, showing how a new African civilization arose out of the conflict-ridden conditions imposed on the old. Themes include economic, social, political, religious, and artistic life, as well as the influences of slavery, colonialism, and nationalism. This course is the same as AFR 1197.

HST 1623 West African History (Group D)

4 Q.H.

A survey of the politics and economics of West Africa from the rise of the Mali Empire to the contemporary problems of national development for the countries from Senegal to Nigeria. This course is the same as AFR 1403.

HST 1624 East African History (Group D)

4 Q.H.

The peoples and cultures of precolonial East Africa, their contacts with each other and the outside world, the impact of British and German colonial rule, the Mau Mau revolt and the struggle for independence, and the colonial heritage in contemporary East Africa. This course is the same as AFR 1401.

HST 1625 South African History (Group D)

4 Q.H.

The historical background to current conflict in the Republic of South Africa and in adjoining Mozambique, Zimbabwe, and Namibia. The rise of the apartheid system—and the opposition and alternatives to it—are examined through the themes of racial conflict, nationalism, and industrialization in this African setting. This course is the same as AFR 1405. (VI)

HST 1633 China since 1850 (Group D)

4 Q.H.

This course focuses on the history of China as it struggled to rid itself of foreign imperialism for one hundred years. Emphasis is placed on the difficult process of gaining strength by modernizing so dominant a traditional culture and on the concepts and policies of China since the communist victory in 1949.

HST 1634 Communist China (Group D)

4 Q.H.

Focus of this course is a close look at the policies and achievements of China since the communists won control in 1949. The major emphasis is upon the background for communist victory, the unique vision of Mao Zetong and his prescriptions for China, and the radical changes since Mao's death and the arrest of the "Gang of Four."

HST 1637 Japan since 1850 (Group D)

4 Q.H.

The course examines the history of Japan since its opening by the West. Emphasis on westernization, the rise of Japan as a world power, and the Japanese experience since the defeat in World War II.

HST 1641 Recent Leaders of Asia (Group D)**4 Q.H.**

This course uses biographies and films to illustrate the lives of Gandhi of India, Ho Ch'i-minh of Vietnam, Mao Zetong of China, and other Asian leaders and the role they played in influencing the revolt against their foreign colonizers. Major themes include the systems of foreign imperialism and the opposition of Asian nationalism.

HST 1644 Third World Women (Group D)**4 Q.H.**

This course provides an exploration of the role of women in the less-developed Third World areas, with special emphasis on factors of change, development, and continuity. (IV)

HST 1652 Islam Resurgent (Group D)**4 Q.H.**

An analysis of what has been called "the militant revival of Islam" as a rallying point for reformist or revolutionary movements in the Muslim world. The course will include little-known Muslim areas outside the Middle East in Africa and Asia. (VI)

HST 1801 Directed Study**4 Q.H.****HST 1805 Approaches to History****4 Q.H.**

Students will undertake a major historical project based on the application of appropriate methodologies and upon the substantive understanding of a single subject chosen by the course instructor and announced in advance of the quarter. The course is rotated among the department's faculty. All history majors are required to take this course, though it is open to all upperclass students. All students must have completed 80 quarter hours of work before taking this course.

HST 1811, HST 1812, HST 1813 Junior-Senior Honors Program**(each) 4 Q.H.**

For details contact the Honors Office, 183 Holmes.

HST 1821 Fieldwork in History I**4 Q.H.**

(Prereq. HST 1101, HST 1102, HST 1201, HST 1202, and 16 Q.H. in other history courses)

This course offers directed work in historical societies, archives, museums, and other historical agencies. Students should consult the Department of History for details.

HST 1822 Fieldwork in History II**4 Q.H.**

(Prereq. HST 1821)

The course offers directed work in historical societies, archives, museums, and other historical agencies. Students should consult the Department of History for details.

INT 1150 Introduction to Women Studies: Image, Myth, and Reality**4 Q.H.**

An introductory course in the study of women in

society, this course encompasses the historical, political, economic, and social processes that have created both the image and reality of women in contemporary society, and offers an overview of the many different disciplinary approaches to the study of women. (II)

INT 1252 Introduction to Irish Studies**4 Q.H.**

Introduction to Irish Studies is taught from the perspective of a number of fields in one-week sequences: art, business, drama, history, literature, music, politics, and sociology. The purpose of the course is to introduce students to the important forces that have helped to shape contemporary Ireland and Irish-American culture.

INT 1215 Into the Ocean World**4 Q.H.**

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but when appropriate, we will focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1216 A History of Seafaring**4 Q.H.**

This course surveys maritime transportation, trade, travel, exploration, and warfare from approximately 3500 B.C. to the end of the wooden boat era in the late nineteenth century. Prior to the widespread application of steam power on land and sea in the nineteenth century, ships were the fastest, safest, and most economical means of transporting large cargoes over long distances. Literary and art history sources are also introduced, along with several films on maritime archaeology.

INT 1217 Water, Water**4 Q.H.**

This course is an interdisciplinary introduction to our most precious resource. Water has affected our bodies, our planet, our history, and our culture. How we manage it will shape our future. Because of increasing demand, waste, and pollution, we are depleting—and risk destroying—the limited supply of usable fresh water. This course will look at water through scientific, historical, and cultural viewpoints, and survey contemporary water problems in all their dimensions—political, economic, and technological. (VI)

Human Services

Please note that some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have questions about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Other courses in the interdisciplinary major in Human Services are listed under the departments in which they are offered, within the College of Arts and Sciences and within the Boston Bouvé College of Human Development Professions.

INT 1330 and INT 1331 Field Experience in

Human Services I & II

4 Q.H. each

Human Services students are required to fulfill two fieldwork placements during the last two years of their program. Placement consists of 150 hours on-site and generally varies according to the students' interest. Examples of placement sites include community centers, nursing homes, vocational workshops, state and federal agencies for children, and recreational facilities. Experiences are supervised by University staff to maximize the students' learning opportunities. (*Junior or Senior status, by permission only*)

INT 1333 Senior Seminar in Human Services

4 Q.H.

Designed for seniors in Human Services, the course examines emerging roles and career options within the human services field. Study will focus on self-examination of attitudes and values affecting delivery of services, exploration of ethical issues and dilemmas relevant to human services, grantsmanship and funding issues, staff supervision and development within human services agencies, and refinement of group leadership skills.

Interdisciplinary Courses

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

INT 1100 Introduction to Art, Drama, and Music

4 Q.H.

This interdisciplinary course offers an integrated approach to three related disciplines: art, drama, and music. Basic vocabulary and analytical techniques are established for each discipline, emphasizing such common elements as color, line, rhythm, texture, and form. Representative works from various periods are examined in the context of the cultures that produced them, and lectures focus on parallels and contrasts among the three disciplines' manifestations of specific trends, principles, and ideals. Lectures, readings, and listening assignments are supplemented by visits to art galleries and attendance at concerts and theatrical performances. (II)

INT 1110 American Musical Theatre

4 Q.H.

This interdisciplinary course, offered by the department of Drama and Music, traces the development of the American musical from works such as *The Black Crook* to the present. The role of musical theatre as both entertainment and serious art form is considered through an examination of script, score, dance, and design. Works by composers and lyricists such as Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter are studied.

INT 1150 Introduction to Women's Studies: Image, Myth and Reality

4 Q.H.

This is an introductory survey of the issues and methodology involved in the interdisciplinary study of women. Such a survey encompasses the historical,

political, economic, and social processes that have created both the image and the reality of women in society. Guest lecturers provide an overview of the many different disciplinary approaches to the study of women. This course is required for women's studies minors and may be used as either a general elective or, depending upon the discipline of the coordinator, to satisfy specific concentration requirements. (II)

INT 1151, 1152 Women's Studies: Seminars in Research

4 Q.H.

These Interdisciplinary Women's Studies Seminars allow students to address problems in depth by researching a topic of particular interest. Careful development of a research plan is encouraged, and opportunities are provided for sharing work in progress and for exchanging findings. These findings involve little in-class time, but much consultation with appropriate faculty. The final product of seminar work and research is a major paper. Students in the Honors Program may substitute one quarter of honors registration for each seminar, but are still expected to attend the formal sessions of the seminar. These seminars are required for women's studies minors.

INT 1165 Special Topics in Sport and Society

4 Q.H.

Special Topics in Sport and Society is designed to augment a variety of courses offered in the area of sports studies. This course will vary depending on the resources and staff available. Previous offerings have been in Law and Sports and Business and Sports.

INT 1201 An Analysis of American Racism 4 Q.H.

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which our attitudes, in turn, shape our institutions. Emphasis is on the practical, day-to-day aspects of racism, rather than the theoretical and historical.

INT 1215 Into the Ocean World 4 Q.H.

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but, when appropriate, we focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1216 A History of Seafaring 4 Q.H.

This course surveys maritime transportation, trade, travel, exploration, and warfare from approximately 3500 B.C. to the end of the wooden boat era in the late nineteenth century. Prior to the widespread application of steam power on land and sea in the nineteenth century, ships were the fastest, safest, and most economical means of transporting large cargoes over long distances. Literary and art history sources are also introduced, along with several films on maritime archaeology.

INT 1217 Water, Water 4 Q.H.

This course is an interdisciplinary introduction to our most precious resource. Water has affected our bodies, our planet, our history, and our culture. How we manage it will shape our future. Because of increasing demand, waste, and pollution, we are depleting—and risk destroying—the limited supply of usable fresh water. This course will look at water through scientific, historical, and cultural viewpoints, and survey contemporary water problems in all their dimensions—political, economic, and technological. (VI)

INT 1252 Introduction to Irish Studies 4 Q.H.

Introduction to Irish Studies is offered from the perspective of a number of fields in one-week sequences: art, business, drama, history, literature, music, politics, and sociology. The purpose of the course is to introduce students to the important forces that have helped to shape contemporary Ireland and Irish-American culture.

INT 1320 Exploring the Humanities Through Film 4 Q.H.

The purpose of this interdisciplinary course is to investigate the ways in which the methods of the humanities can expand one's awareness of the sources, statements, and meanings of popular films. Students will see a series of movies and analyze and

evaluate them in the light of readings, the various approaches presented by faculty members from a number of humanistic disciplines, and their own experience.

INT 1340 Cultural Aspects of International Business 4 Q.H.

(Prereq. Middler standing)

Using a managerial perspective, this course covers issues that arise when a firm moves from its home country to a host country that may have a different national culture. Although it will usually assume the perspective of the United States-based firm that operates abroad, it will spend some time on what happens to other national firms operating in the United States and in third-country environments. The way in which "corporate culture" evolves, in the context of national culture and the impact on managers, will be a central issue.

INT 1400 Professional Practices: Individual and Social Dimensions 4 Q.H.

The course explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socioeconomic conditions, by clients, and by other professionals. Case histories are examined to illustrate the dilemmas professionals face, the choices that are typically made, and the consequences these have on the freedom of the practitioner, and on personal and professional integrity.

INT 1401 Health Professionals: Past, Present, and Future 4 Q.H.

This course focuses on social history of the modern health professions. The course explores long-range patterns in the organization and regulation of the health professions, beginning with the Middle Ages and emphasizing the Jacksonian period, industrialization, modern professional organizations, the growing role of the state, responses of the health professions, and the future of health care in the United States under various corporate/government schemes for reorganization and "accountability".

INT 1580 Physical Chemistry with Biological Applications 4 Q.H.

(Prereq. BIO 1236)

This course examines physiochemical principles as they apply to biological processes. Topics include chemical equilibria, reaction kinetics, basic thermodynamics, oxidation-reduction reactions, bioenergetics, macromolecules in solution, and transport. The approach is quantitative, and problem solving as a tool for learning is emphasized. Basic assumptions and limitations underlying principles are explained; for the most part, however, rigorous derivations are avoided. Applications to basic experimental techniques in biochemistry are made by way of relevant biochemical examples.

Journalism

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on page 1-2.

JRN 1103 Newswriting I

4 Q.H.

(Prereq. ENG 1275 with grade of C or better)

Functions of the editorial department and procedures in obtaining and writing news stories. Extensive news writing. Introduction to interviewing. Legal issues defined. Typing skills required.

JRN 1104 Newswriting II

4 Q.H.

(Prereq. JRN 1103 with grade of C or better)

Practice in multi-source and breaking stories. Introduction to government and court reporting. Advanced work in interviewing, and writing under deadline pressure. Discussion of legal issues.

JRN 1206 Editing

4 Q.H.

(Prereq. JRN 1104 with grade of C or better)

Practice in copy editing and headline writing. Assignments in photo selection, cropping and cutline writing. Introduction to page layout.

JRN 1250 Interpreting the Day's News

4 Q.H.

Study of the news of the day and the function of the newspaper, news magazine, and news broadcasts in American life. Topics include rights and responsibilities of the press and how news is gathered, processed, and disseminated by the various media. For non-majors as well as majors. (VI)

JRN 1301 Basic Photojournalism

4 Q.H.

(Prereq. JRN 1103)

Camera and darkroom procedures will be covered along with cropping, assignment techniques, theory, and photo caption methods.

JRN 1305 Techniques of Journalism

4 Q.H.

(Prereq. JRN 1104)

Writing in-depth and multiple-source stories requiring significant research. Introduction to investigative reporting. Feature writing. Review of legal issues.

JRN 1320 Radio News Gathering and Reporting

4 Q.H.

(Prereq. JRN 1103)

Writing and editing news for radio, with practice in interviewing, organizing news scripts, and integrating audio materials into broadcast.

JRN 1336 Public Relations Principles

4 Q.H.

(Prereq. Sophomore standing)

Principles, history, and methods of public relations; processes of influencing public opinion; responsibilities of the public relations practitioner; analyses of public relations programs.

JRN 1350 Advertising Principles

4 Q.H.

(Prereq. Sophomore standing)

Development, procedures, economic functions, and

responsibilities of advertising: planning, research, production, and other elements that go into successful advertising.

JRN 1421 Television Newswriting

4 Q.H.

(Prereq. JRN 1103)

Writing for television news as opposed to writing for other news media; importance of the writer-reporter as field-producer and writer-producer; terms and language used in the production of TV news shows. Actual individual production of news shows; field trips to TV stations; guest lecturers from the TV news media.

JRN 1422 Television News Production

4 Q.H.

(Prereq. JRN 1103 and JRN 1421, or permission of instructor)

Techniques used by the electronic journalist and TV news producer. Students will have the opportunity to build a TV news show. Reporting with portable TV cameras and editing equipment.

JRN 1430 Sports Reporting

4 Q.H.

(Prereq. JRN 1104)

Principles of news reporting applied to covering men's and women's sports for print and broadcast media. Emphasis is given to using sports reference materials, developing contacts, interviewing, and structuring the sports story. Investigative reporting in sports also is discussed.

JRN 1428 The Role of Journalism in Sports

4 Q.H.

Analysis of the impact of journalism on the institution of sports in this country and around the world. Sports reporting as a motivator and demotivator from Little League to college and professional levels. Effect of news media coverage on violence in organized sports, on America's physical fitness, and on other aspects of society are covered.

JRN 1432 Local Government Reporting

4 Q.H.

(Prereq. JRN 1104)

Coverage of town/city government, with emphasis on the "beat" approach to reporting public affairs. Practical, in-the-field experience is emphasized in such projects as town meetings, meetings of boards of selectmen, and other commissions and bodies transacting public business.

JRN 1440 Design and Graphics

4 Q.H.

(Prereq. JRN 1206)

Layout and design principles applied to newspapers, magazines and other print media. Type faces, copy measuring, dummies, photo sizing, keeping copy flow charts. Application of design and graphics principles to advertising layout.

JRN 1451 Advertising Copy Writing 4 Q.H.

(Prereq. JRN 1103, JRN 1350)

Theory and techniques of creating advertising copy for newspapers, magazines, radio, television, and direct mail. Fact gathering, copy structure, and advertising design are emphasized.

JRN 1460 Public Relations Problems 4 Q.H.

(Prereq. JRN 1336)

Application of public relations techniques to problems; case studies in industry, labor, education, government, social welfare, and trade associations.

JRN 1501 History of Journalism 4 Q.H.

Development of American journalism from its European and English beginnings. Topics include: the colonial press, the great personal journalists of the nineteenth century, and the impact of major technological changes in mass communications media in the twentieth century. Some writing required.

JRN 1508 Law of the Press 4 Q.H.

Legal problems of libel, invasion of privacy and access to government information; the balance between private rights and the public's "need to know."

JRN 1512 Journalism Ethics and Issues 4 Q.H.

(Prereq. JRN 1501)

Responsibilities of news media; ethical problems confronting decision makers in various journalistic fields: the principles found in codes of the American Society of Newspaper Editors, the Associated Press Managing Editors, the Society of Professional Journalists, and other organizations. Some writing required.

JRN 1522 Magazine Writing 4 Q.H.

(Prereq. JRN 1104 or consent of instructor)

Writing and free-lancing magazine articles; analyzing magazines as markets; selecting the best feature format—how-to-do-it, profile, personal experience, human interest, interpretive pieces, and others.

JRN 1530 Advanced Reporting 4 Q.H.

(Prereq. JRN 1104)

Advanced investigative and team reporting. Series stories and research; precision reporting.

JRN 1552 Advertising Practice 4 Q.H.

(Prereq. JRN 1451)

Preparation of advertising for print and broadcast media, including campaign planning and space and time buying and scheduling. Product research, consumer surveys, and measuring the effects of advertising.

JRN 1561 Public Relations Practice 4 Q.H.

(Prereq. JRN 1103 and JRN 1336)

Practices and techniques employed in the field, including organization of events and functions. Campaign planning, research, and media relationships are studied.

JRN 1575 Publication Production and Management 4 Q.H.

(Prereq. JRN 1206)

Examination of the organizational structure, production methods, and management procedures of print media companies. Interaction of business, advertising, production, and circulation departments.

JRN 1617 The Constitution and Mass Communications 4 Q.H.

The meaning of freedom of the press, explored through study and discussion of the evolving First-Amendment interpretations of the United States Supreme Court.

JRN 1635 Journalism and the Mass Media 4 Q.H.

Seminars featuring well-known professionals from major newspapers, radio-TV stations, wire services, magazines, photography, and public relations. An up-to-date, in-depth exploration of techniques and theories used in various media.

JRN 1870, JRN 1880 Seminar 4 Q.H.

(Prereq. Upperclass standing)

Discussions and readings on topics of current significance in various journalistic fields.

JRN 1890, JRN 1891 Directed Study in Journalism (each) 4 Q.H.**JRN 1892 Topics 4 Q.H.****JRN 1894, JRN 1895, JRN 1896, JRN 1897, JRN 1898 Honors in Journalism (each) 4 Q.H.**

Linguistics

Courses in linguistics are offered in the following departments:

English:ENG 1118 Introduction to Language and Linguistics

ENG 1119 Foundations of the English Language

ENG 1401 Introduction to Syntax

ENG 1402 Grammars of English

ENG 1407 Introduction to Semantics

ENG 1408 Topics in Linguistics

ENG 1690 Seminar in Stylistics

Modern Languages:LNL 1235 Applied Linguistics

LNG 1236 Applied Linguistics II

Philosophy and Religion:PHL 1215 Symbolic Logic
PHL 1440 Philosophy of Language

Psychology:PSY 1261 Bilingualism
PSY 1262 Language and Cognition
PSY 1263 Body Language
PSY 1264 Animal Communication
PSY 1361 Introduction to Phonetics
PSY 1362 Child Language
PSY 1363 Linguistics of American Sign Language
PSY 1364 Cognition
PSY 1365 Language and the Brain
PSY 1562 Laboratory in Psycholinguistics
PSY 1661 Seminar in Psycholinguistics
PSY 1662 Seminar in Cognition

Sociology/Anthropology: SOA 1135 Language and Culture

These courses are described under the different department headings. The interdepartmental major in linguistics and its corresponding minor are described on page 11 of this *Guide*.

Modern Languages

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office before taking the course.

Film

The following film courses are offered in the Modern Languages Department. For additional film courses, consult the Film listings.

LNF 1321 French Film Masterpieces 4 Q.H.

An introduction to some of the qualities that have made French Film one of the great national cinemas. The course will focus on both form and content and will relate outstanding directors' major works to the French culture and society of their period. Taught in English; may be taken for French credit if assignments are completed in French. (Also listed as FLM 1321)

LNF 1550 Introductory Film Analysis 4 Q.H.

The course's major goal is the cultivation of critical skills in analyzing the film medium, enabling students to spot and articulate ways in which film shapes their experience. The course will be presented in three units: Film Form, Narrative Form, and Film Style. Form, and its most prevalent manifestation, narrative form, can be said to be the way in which the parts of a film are related to one another to create a whole. Style, including mise-en-scene, cinematography, editing, and sound, will be studied in relation to audience expectations and the constitutive role of film form. The course will be organized around weekly film screenings and individual study of films put on reserve in the video section of the Learning Resource Center of Dodge Library.

LNF 1551 Film Theory 4 Q.H.

A study of the fundamental issues that surround the investigation into the nature and possibilities of film

art. Students will be introduced to a variety of theoretical approaches, including semiotics, auteur theory, psychoanalysis, and feminism. Weekly screenings will focus on two or three topics: a film author (such as Buñuel, Truffaut, or Welles), a well-defined film movement (such as neorealism, the New German cinema, or the French New Wave), or films about filmmaking practice. Students will be asked to read a number of articles and to write a research paper using the resources (including film journals) of Dodge Library. (Also listed as FLM 1221)

LNF 1560 Film and Psychoanalysis 4 Q.H.

This course will explore the nature and possibilities of the psychoanalytic interpretation of film. The course will demonstrate that such an approach offers an additional dimension to the analysis of a work of art. The principal focus will be on elements in the work that are derivative of unconscious processes. Thus, fantasies, dreams, symbolism, and imagery will be given special attention. Material in the works studied that relates to neurotic conflicts, character structure and formation, interpersonal relationships, and distortions in psychological development will be brought into the discussion. Weekly film screenings will be accompanied by lectures and discussions; each student will select one film (placed on reserve in the Learning Resources Center of Dodge Library) for individual study on a topic of his/her choice. (Also listed as FLM 1260)

LNS 1550 Spanish Film Masterpieces 4 Q.H.

Spanish cinema from 1960 to the present, focusing on

recognized masters such as Buñuel and Saura, but including other award-winning films based on novels and events in the Spanish Civil War. The course will stress the way that the realism of the Spanish cinema is combined with surrealist imagery and metaphor to create a distinctive visual style and content.

The following courses offered in the Department of Modern Languages are conducted in English for possible advanced language credit. Please consult instructor.

LNF 1510 Modern Philosophical French Literature in Translation **4 Q.H.**

Camus and Sartre are considered to have been the spokesmen for their generation's philosophical concerns. Works by these two authors are studied in the course and a working knowledge of existentialism is developed from them. Course given in English.

LNF 1511 The Theme of Solitude In French Literature **4 Q.H.**

Course conducted in English. Texts read in English translation (those who wish to do so may read them in French). The multiple facets of the theme of solitude are traced from the beginnings of French literature to the present. Viewed as a source of both wonder and anguish, solitude is studied in its various manifestations, including banishment, imprisonment, expatriation, and seclusion. The phenomena of moral and spiritual solitude are examined as well. Among authors studied are Charles d'Orleans, Du Bellay, Rousseau, Chateaubriand, Hugo, Verlaine, Mauriac, and Camus.

LNF 1512 Masterpieces of Modern European Fiction **4 Q.H.**

This course is conducted in English and focuses on modern European authors, including Dostoevski, Mann, Kafka, Proust, Gide, and Camus. Their works are viewed as commentaries on their respective societies and, more generally, as investigations of the human condition.

LNF 1513 French Seminar: Voltaire and Rousseau **4 Q.H.**

This course offers an opportunity to study and compare the two great figures of the eighteenth century. Through an analysis of their works, students may determine how, by their contrasting interests, personalities, and views of society, these writers contributed to fundamental changes in the political, philosophical, and literary world of their time—and ours. Class discussion, oral and written reports. Conducted in English. Offered in alternate years.

LNS 1500 Backgrounds in Hispanic Culture I **4 Q.H.**

A multimedia approach is utilized to present the rich panorama of the humanities from Altamira to modern times. A reading knowledge of Spanish is helpful but not required, since the course is conducted in English. Field trips, concerts, guest speakers, and individual study projects enhance this exploration of Spanish creativity.

LNS 1501 Backgrounds in Hispanic Culture II

4 Q.H.

This course spans the time from pre-Columbian days to the present in Latin America, exploring culture, traditions, and attitudes. A multimedia approach with field trips and guest lecturers. Conducted in English.

LNS 1510 Saints and Sinners: The Vision of Women in the Middle Ages and the Renaissance

4 Q.H.

Topics include the attainment of and the atonement for love; society's changing attitude toward women as reflected in the literature of the times. Selected fabliaux, short stories, poems, and plays from Boccaccio, Chaucer, Ruiz, Rojas, Machiavelli, Lope de Vega, Calderon, Quevedo, Racine, Middleton, as well as women writers. Reference is made to historical and sociological materials. This course is offered in English. All required readings are in translation.

LNS 1511 Introduction to Caribbean Literature

4 Q.H.

A comparative introduction to the modern literary traditions of the Spanish-, English-, and French-speaking Caribbean. Authors read include Carpentier (Cuba), Naipaul (Trinidad), Zobel (Martinique), Cardenal (Nicaragua), and more.

LNS 1512 The Don Juan Figure in Literature

4 Q.H.

A seminar course dealing with the emergence and development of the Don Juan figure in Western literature. The course will be taught in English, although it will focus upon many works which were originally written in other languages (they will be read in English translation). It will attempt to analyze the character of Don Juan, beginning with his first appearance in the theater of seventeenth-century Spain, and following his development well into the twentieth-century. The course will strive to develop an appreciation and understanding of the character of Don Juan through the centuries, and to analyze the similarities and the differences that may be seen in the character from one cultural milieu to another.

LNI 1510 The Works of Dante in Translation I

4 Q.H.

This course considers briefly the cultural background and various literary schools that influenced Dante. His life, his character, and minor works are discussed. The *Vita Nuova* and the first cantica of the *Divina Commedia*, the "Inferno," are read and analyzed in some detail. This course is intended for students of any background or major. Bilingual texts are used so that students with a background in Italian and others, may refer to the original for added interest and enrichment. Classes are conducted in English.

LNI 1511 The Works of Dante in Translation II

4 Q.H.

This is a continuation of LNI 1510, but may be taken separately. The other two parts of the *Divina Commedia*, "Purgatorio" and "Paradiso," are studied in

detail. The course is open to anyone. Bilingual texts used. Classes conducted in English.

LNI 1512 Italian Seminar: Pirandello 4 Q.H.

By viewing reality in man's world and man's personality with strikingly new insights, Pirandello contributed a new dimension to our understanding of human nature and brought about significant changes to the traditional conception of the theatre. This course examines the originality and art of Pirandello by a close study of some of his great plays and short stories. Class discussions, oral and written reports. Conducted in English. Offered in alternate years.

LNR 1500 Backgrounds In Russian Culture 4 Q.H.

Designed to offer the student a view of Russian culture and civilization, the course utilizes guest speakers,

films, field trips, and discussions. Conducted in English.

LNR 1510 The Works of Alexander Pushkin in Translation 4 Q.H.

This course offers a survey and analysis in English of Pushkin's artistic prose, lyric poetry, correspondence, friendships, and major literary influences.

LNR 1511 Russian Literature in Translation 4 Q.H.

A companion to LNR 1510, this is a survey and analysis in English of some of the works of Tolstoi, Dostoevski, Chekhov, and others.

Prerequisites listed for Modern Languages are based on current course numbers at Northeastern. If approved by the Department of Modern Languages and the dean's office, equivalent course work acquired elsewhere may be considered acceptable to satisfy these prerequisites. The following courses are offered in English, and no knowledge of a foreign language is required to take them: LNF 1510, LNF 1511, LNF 1512, LNF 1513, LNI 1510, LNI 1511, LNI 1512, LNR 1500, LNR 1510, LNR 1511, LNS 1500, LNS 1501, and LNS 1510. Locate these courses under the appropriate heading for course descriptions. Language majors interested in obtaining major credit for any of these courses should consult their instructor.

Chinese

LNC 1101 Elementary Chinese I 4 Q.H.

This is a course in "Mandarin" Chinese designed to acquaint the student with features of the spoken and written language. Grammar, oral performance, and simple characters are stressed. For students who wish to speak another dialect of Chinese, consult instructor for proper placement.

LNC 1102 Elementary Chinese 4 Q.H.

(Prereq. LNC 1101)

This course is a continuation of LNC 1101. Grammar and spoken and written forms of the language are studied.

LNC 1103 Intermediate Chinese I 4 Q.H.

(Prereq. LNC 1102)

This course is a continuation of LNC 1102. More advanced features of the language. Continued study of characters.

LNC 1104 Intermediate Chinese II 4 Q.H.

(Prereq. LNC 1103)

This course is a continuation of LNC 1103. More advanced work in grammar, conversation, and characters.

LNC 1801 Directed Study in Chinese 4 Q.H.

and the varied cultures within the world of French speakers. Laboratory practice complements classwork, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

LNF 1102 Elementary French II 4 Q.H.

(Prereq. LNF 1101)

This course's intent is to continue and broaden beginners' exposure to the "four skills"—oral comprehension, speaking, reading, and writing French—so that the linguistic tools needed to understand and function in foreign contexts—at home, abroad, and in the world of literature and film—may be acquired.

LNF 1103 Intermediate French I 4 Q.H.

(Prereq. LNF 1102 or equiv.)

This course, for students who wish to further their audio-lingual skills and improve their reading and writing, combines a review and continued study of grammar essentials with oral, writing, and language laboratory practice. Varied readings include journalistic, cultural, and modern literary texts. Classes are conducted in French as much as possible so that students may exercise their new skills.

LNF 1104 Intermediate French II 4 Q.H.

(Prereq. LNF 1103)

This course uses the fundamentals of French to promote effective self-expression through speaking and writing and to explore the idiomatic aspects of the language. Through progressive class discussions and oral and written commentaries, students analyze a contemporary French novel or a French cultural reader, screenplay, or collection of short stories. The course strives, first, to help students read and comprehend modern French writing with confidence, and

French

LNF 1101 Elementary French I 4 Q.H.

Designed for students with very little or no prior knowledge of French, this course provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. The audiolingual approach, using practical vocabulary drawn from realistic situations, aims at good pronunciation and ease in response. Each lesson incorporates helpful information about daily life in France

to be able to talk and write about it in good French; and second, to provide them the opportunity to prepare for advancement to courses beyond the intermediate level.

LNF 1107 Reading French in the Arts and Sciences 4 Q.H.

(Prereq. LNF 1102 or equiv.)

This course is designed for those students who wish to develop their reading skills, without regard to other aspects of the language such as speaking or writing. To this end, the grammar necessary for reading is stressed, together with vocabulary building. Scientific and nonscientific texts are read. This course may also provide assistance to students, graduate and undergraduate, who need to pass a reading examination to fulfill specific degree requirements. However, it should be made clear that this course is not a substitute for LNF 1103 or LNF 1104 (Intermediate French).

LNF 1111 Elementary French for Business 4 Q.H.

This course is similar to LNF 1101, but has added features relevant to business students, such as specialized vocabulary related to the business world, and an immediate introduction to French business texts. LNF 1102 can be taken as a sequel to LNF 1111.

LNF 1201 French Composition and Conversation I 4 Q.H.

This course is designed for qualified students who wish to work on improving their proficiency in speaking and writing French through oral reports, class discussions, compositions, and an advanced review of fundamentals. Grammar work focuses on the students' particular needs as well as the nuances of the language. Varied readings in a range of styles—popular to literary—provide insight into French life and culture. Conducted in French.

LNF 1202 French Composition and Conversation II 4 Q.H.

(Prereq. LNF 1201 or equiv.)
A continuation of LNF 1201, with emphasis on individual work, oral presentations, discussions, related grammar, and analysis of readings. Conducted in French.

LNF 1203 Advanced French Proficiency I 4 Q.H.

(Prereq. LNF 1201 and LNF 1202 or equiv.)
Emphasis is on further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion of articles from current periodicals. Special attention is given to the latest trends in spoken French, the study of idioms and proverbs, as well as selected examples of "argot" (slang).

LNF 1204 Advanced French Proficiency II 4 Q.H.

(Prereq. LNF 1201 and LNF 1202 or equiv.)
This course is the continuation of LNF 1203. In addition to further study in the areas covered in course LNF 1203, each student is expected to pursue one major project throughout the course, to be completed at the end of the quarter—such as planning

and writing an original French magazine with one article to be submitted each week of the term.

LNF 1225 Introduction to the French-Speaking World 4 Q.H.

(Prereq. LNF 1104 or equiv.)

This course offers a cultural introduction to the French-speaking world through the study of various reading selections in the textbook *Le Monde Français*. These selections, which stress vocabulary building and proper usage of a wide variety of grammatical forms, deal with the traditional backgrounds and aspects, as well as the contemporary and "pop" aspects, of the cultural heritage of the world's French speakers. France will be the main, but not the exclusive, focus of this course.

LNF 1231 Masterpieces of French Literature I 4 Q.H.

(Prereq. LNF 1104 or equiv.)
This course provides an introduction to French poetry, theatre (both comedy and tragedy), novels, and autobiographies through the study of key works from the Middle Ages and Renaissance through the Age of Enlightenment. The course includes such writers as Villon, Molière, Racine, Voltaire, and Rousseau. The course, conducted largely in French, aims to acquaint students with a critical approach to reading; to help them improve their reading, speaking, and writing skills; and to apply these new skills to a greater understanding and appreciation of major French contributions to Western culture. Group discussions are encouraged in an effort to bring out the relation between the texts and contemporary issues. (II)

LNF 1232 Masterpieces of French Literature II 4 Q.H.

(Prereq. LNF 1104 or equiv.)
A continuation of LNF 1231, which is not necessarily a prerequisite. The course presents some of the most interesting and significant works of literature from the Romantic Age to the present. Among the readings are an "existential" play by Musset, poetry by Baudelaire and Verlaine, and fiction by Flaubert, Camus, and Robbe-Grillet. For a description of methodology, see LNF 1231. (II)

LNF 1305 French Literature in the Seventeenth Century 4 Q.H.

(Prereq. LNF 1232 or equiv.)
This course presents a study of the nondramatic literature of seventeenth-century France from the baroque through the classical periods. The course studies a rich and diverse body of writing encompassing philosophy, poetry, the table, the novel, and epistolary writing. Among the authors treated are Descartes, Pascal, La Rochefoucauld, La Fontaine, Boileau, Mme. de Sévigné, and Mme. de La Fayette. Offered every other year.

LNF 1306 French Theatre in the Seventeenth Century 4 Q.H.

(Prereq. LNF 1232 or equiv.)
This course offers a study of the dramatic literature of seventeenth-century France, from the baroque

through the classical periods. Tragedy is studied in the works of Corneille and Racine; comedy, in those of Molière. Offered every other year.

LNF 1307 French Literature of the Eighteenth Century I **4 Q.H.**

(Prereq. LNF 1232 or equiv.)

The eighteenth century in France, known as the Age of Enlightenment, was an age of challenge to established authority in all areas, and an age of changing ideas and ideals. This intellectual and political vitality is reflected in the representative works of Marivaux, Montesquieu, Prevost, and Voltaire. Class discussions, oral and written reports. Conducted in French, but English is allowed. Offered every other year.

LNF 1308 French Literature of the Eighteenth Century II **4 Q.H.**

(Prereq. LNF 1232 or equiv.)

Toward the latter half of the century we begin to see both the achievements brought about by the spirit of enlightenment and at the same time the awakening of the romantic sensibility, particularly in such authors as Diderot, Rousseau, St. Pierre, Laclos, and Beaumarchais. Class discussions, oral and written reports. Conducted in French, but English is allowed. Offered in alternate years.

LNF 1309 French Literature of the Nineteenth Century I **4 Q.H.**

(Prereq. LNF 1232 or equiv.)

Romanticism is treated as a major cultural phenomenon affecting man's view of his world and the way he expresses experience. In this context, the course examines romanticism in poetry and drama, as well as its continuation into the realist novel. Among the authors read are Victor Hugo in poetry and the drama, and Honoré de Balzac in the novel. In addition there are selections from other writers who represent aspects of romanticism and realism. Conducted principally in French. Offered every other year.

LNF 1310 French Literature of the Nineteenth Century II **4 Q.H.**

(Prereq. LNF 1232 or equiv.)

This course deals with the reaction against romanticism: aestheticism and personal modes of expression in contrast to the enthusiasm of the early romantics. The course deals with a novel by Gustave Flaubert and the verse of Charles Baudelaire in *Les Fleurs du Mal*, and the poets who followed in Baudelaire's footsteps. Flaubert and Baudelaire are seen as precursors of modern literature. Conducted principally in French. Offered every other year.

LNF 1311 French Literature of the Twentieth Century I **4 Q.H.**

(Prereq. LNF 1232 or equiv.)

This course offers a study of the major movements in the narrative and dramatic prose writers prior to World War II, including Alain-Fournier, Proust, Claudel, Gide, Mauriac, and Saint Exupéry. Students are required to read a work from each author, discuss it in class, and present oral and written reports. Conducted in French, but English may be used. Offered in alternate years.

LNF 1312 French Literature of the Twentieth Century II **4 Q.H.**

(Prereq. LNF 1232 or equiv.)

This course focuses on the trends in postwar fiction, with particular consideration of the struggle to find meaning in an absurd world. Analysis of significant works by Giraudoux, Montherlant, Sartre, Camus, Anouilh, Ionesco, and Beckett. Oral and written reports, class discussions. Conducted in French, but English may be used. Offered in alternate years.

LNF 1315 French Poetry, Past and Present **4 Q.H.**

From the Middle Ages to the present day, French poets have derived inspiration from such universal themes as love, nature, and the human condition. This course will provide students with a survey of French poetry through the ages, focusing on representative works of the major French poets. Poems will be studied in their literary and historical context, with an examination of various aspects of French versification. Conducted in French.

LNF 1400 Seminar: Critical Methodology and Practice in French Literature **4 Q.H.**

(Prereq. Excellent reading knowledge of French)

The seminar treats one modern French writer in terms of a critical methodology developed in the first part of the seminar based on modern critical practice.

LNF 1401 Seminar: Trends in Modern French Literature **4 Q.H.**

(Prereq. Excellent reading knowledge of French)

The seminar examines a trend in modern French literature and develops a critical methodology useful for this analysis.

LNF 1801, LNF 1802, LNF 1803, LNF 1804, LNF 1805 Directed Study **(each) 4 Q.H.**

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

Junior-Senior Honors Program **(each) 4 Q.H.**

For details contact the Honors Office.

Spanish

Prerequisites listed for Modern Languages are based on current course numbers at Northeastern. Equivalent course work done elsewhere may be considered acceptable to satisfy these prerequisites.

LNS 1101 Elementary Spanish I **4 Q.H.**

The course includes presentation of essentials of correct usage through acquisition of basic skills in reading, writing, speaking, and aural comprehension.

LNS 1102 Elementary Spanish II **4 Q.H.**

(Prereq. LNS 1101 or equiv.)

Continuation of language instruction with increasing attention to vocabulary and skills relevant to persons who wish to become involved with the Hispanic world.

LNS 1103 Intermediate Spanish I 4 Q.H.
(Prereq. LNS 1102 or equiv.)

Included are completion of basic grammatical usage; reading of contemporary Hispanic plays; oral and written communication based upon assigned readings.

LNS 1104 Intermediate Spanish II 4 Q.H.
(Prereq. LNS 1103 or equiv.)

The course offers intensive reading of topics of current interest; conversation practice utilizing skills acquired in previous course work; and composition practice based upon varied assigned topics.

LNS 1105 Conversational Spanish I 4 Q.H.

(Prereq. LNS 1104 or equiv.; open to nonmajors only) Emphasis is on helping students develop the ability to speak and comprehend Spanish. Particularly able students may be accepted after having completed only LNS 1103. In this case, LNS 1105 may be used to satisfy the language requirement.

LNS 1106 Conversational Spanish II 4 Q.H.

(Prereq. LNS 1105 or equiv.; open to nonmajors only) Continuation of LNS 1105, with continuing emphasis on the development of oral facility in Spanish. Particularly able students may be accepted after having completed only LNS 1104.

LNS 1130 Intensive Spanish 8 Q.H.

This course encompasses the same material covered in LNS 1101 and LNS 1102. Students with language-learning ability and a commitment to the study of foreign languages are encouraged to take the course. Students are expected to assimilate the material at an accelerated pace. This is a two-sequence course; students must enroll in both sequences. Satisfactory completion of this course enables the student to take LNS 1103 if he or she wishes.

LNS 1201 Spanish Composition and Conversation I 4 Q.H.

This course offers practice in writing and speaking Spanish, including written and oral resumes, prepared speeches and themes, and impromptu speaking and writing. A review of the more subtle problems of grammar.

LNS 1202 Spanish Composition and Conversation II 4 Q.H.

(Prereq. LNS 1201 or equiv.) This course offers further practice in oral and written Spanish; continued study of problems of advanced Spanish grammar.

LNS 1203 Advanced Spanish Proficiency I 4 Q.H.
(Prereq. Permission of instructor)

This course is designed for those preparing to enter the teaching profession, as well as qualified advanced students. Advanced elements of Spanish syntax, with emphasis upon achieving superior speaking, reading, and writing skills.

LNS 1204 Advanced Spanish Proficiency II 4 Q.H.

(Prereq. LNS 1203 and permission of instructor) Continuation of aims and goals of LNS 1203.

LNS 1231 Masterpieces of Spanish Literature I 4 Q.H.
(Prereq. LNS 1104 or equiv.)

An introductory course tracing the development of Spanish literature from its beginnings in the Middle Ages (las jarchas, *El poema del Cid*, *El libro de buen amor*, *La Celestina*, etc.) through the Renaissance and Baroque periods or Golden Age (Garcilaso de la Vega, the picaresque novel, the mystics, Cervantes, Lope de Vega, Calderon, etc.). Classes are conducted in Spanish.

LNS 1232 Masterpieces of Spanish Literature II 4 Q.H.

(Prereq. LNS 1104 or equiv.) A continuation of LNS 1231, surveying the literature of eighteenth-, nineteenth-, and twentieth-century Spain. Included are the literary movements of romanticism, realism, and the generation of '98. Classes are conducted in Spanish.

LNS 1301 Spanish Literature of the Middle Ages 4 Q.H.

(Prereq. LNS 1232 or equiv.) The course offers selections from the major works of the Middle Ages, from *El poema del Cid* to the *Libro de buen amor*. Conducted in Spanish.

LNS 1303 Spanish Literature of the Fifteenth and Sixteenth Centuries 4 Q.H.

This course examines selections from the major works of the fifteenth and sixteenth centuries. Some of the works to be considered are *La Celestina*, *Lazarillo de Tormes*, and *El Romancero*. Conducted in Spanish.

LNS 1305 Cervantes and His Times 4 Q.H.

(Prereq. LNS 1232 or equiv.) The course examines selections from Cervantes' minor works (the *Entremeses* and the *Novelas ejemplares*); emphasis, however, is on *Don Quixote*, Spain's greatest literary masterpiece. Conducted in Spanish.

LNS 1306 Spanish Golden Age Theatre 4 Q.H.

(Prereq. LNS 1232 or equiv.) The course examines plays by the outstanding dramatists of the seventeenth century: Lope de Vega, Calderon de la Barca, Tirso de Molina, Ruiz de Alarcon, and others. Conducted in Spanish.

LNS 1309 Spanish Literature of the Nineteenth Century I 4 Q.H.

(Prereq. LNS 1232 or equiv.) The course includes readings in the prose, poetry, and drama of the romantic period, including selections from el Duque de Rivas, Larra, Espronceda, Zorrilla, and Becquer. Conducted in Spanish.

LNS 1310 Spanish Literature of the Nineteenth Century II 4 Q.H.

(Prereq. LNS 1232 or equiv.) This course offers a study of some of the major novelists of the second half of the nineteenth century, such as J. M. de Pereda, Juan Valera, Emilia Pardo Bazan, and B. Perez Galdos. Conducted in Spanish.

LNS 1311 Spanish Literature of the Twentieth Century I 4 Q.H.

(Prereq. LNS 1232 or equiv.)

The course examines selections from the writings of the Generation of '98: Unamuno, Valle-Inclán, Pío Baroja, Benavente, Azorín, and the Machado brothers.

LNS 1312 Spanish Literature of the Twentieth Century II 4 Q.H.

(Prereq. LNS 1232 or equiv.)

The course focuses on prose and poetry of modern writers, such as Ortega y Gasset, Pérez de Ayala, García Lorca, Juan Ramón Jiménez, Gironella, and José Cela.

LNS 1315 Latin American Literature 4 Q.H.

(Prereq. LNS 1232 or equiv.)

The course focuses on early Latin American literature: the literature of the colonial period and the early nineteenth century, based primarily on selections from an anthology.

LNS 1316 Latin American Literature 4 Q.H.

(Prereq. LNS 1232 or equiv.)

This course focuses on modern Latin American literature; readings from nineteenth- and twentieth-century prose and poetry.

LNS 1400 Spanish Seminar 4 Q.H.

This course is designed primarily for majors who have progressed to the upper-level literature courses in Spanish. However, nonmajors who show exceptional background may be admitted with the instructor's permission. The course focuses upon a narrowly defined theme (i.e., a single author, a single work, or a single theme), which students are asked to explore in depth; students are expected to present a final paper based upon individual research.

LNS 1401 Seminar in Spanish Literature 4 Q.H.

(Prereq. Permission of instructor)

This is an upper-level literature course designed primarily for majors, although nonmajors who show exceptional background in Spanish may be admitted. Students are expected to read a selected group of Galdós's novels, and the class meetings will concentrate on a detailed discussion and analysis of the works read. There are collateral readings as well, and a final paper on a topic to be selected by the student.

LNS 1402 Seminar in the Contemporary Spanish Theatre 4 Q.H.

(Prereq. LNS 1232 or permission of instructor)

In contrast to the typical bourgeois theatre of consumption in Spain, there exists a number of dramatists committed to revealing the tragic social and existential aspects of the human condition. Emphasis is placed on authors such as Vallejo, Sartre, the members of the *generación realista*, and the "underground" playwrights. Classes are conducted in Spanish. Class participation as well as oral and written projects required. Alternates yearly with LNS 1401.

LNS 1801, LNS 1802, LNS 1803, LNS 1804, LNS 1805 Directed Studies (each) 4 Q.H.

Directed Studies offer students a way of going beyond

work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

LNS 1820, LNS 1821, LNS 1822, LNS 1823 Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

LNL 1235 Applied Linguistics 4 Q.H.

The course explores the process of language learning and the nature of this experience for infants and adults. Emphasis is on the child's ability to master successfully the complex essentials of its first language by the age of five, and how the development of cognitive capacity and language-learning ability are related. The role of the parent and of the physical environment will also be discussed. Other topics include second-language learning, contrastive analysis, learning English as a second language or dialect, sign language, the significance of "errors," learning strategies, and a survey of language-teaching methods.

German

Prerequisites listed for Modern Languages are based on current course numbers at Northeastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

LNG 1101 Elementary German I 4 Q.H.

This course is designed to provide instruction in the basic grammatical structure of German through practice in listening comprehension, speaking, reading, and writing. Instruction is provided in the classroom and in the language laboratory. No previous study of German necessary. (Special sections of this course are run for business students.)

LNG 1102 Elementary German II 4 Q.H.

(Prereq. LNG 1101 or equiv.)

A continuation of LNG 1101, this course emphasizes helping students to increase their knowledge of the basic grammatical structure of German and to develop additional flexibility in the four language skills. (Special sections of this course are run for business students.)

LNG 1103 Intermediate German I 4 Q.H.

(Prereq. LNG 1102 or equiv.)

This course offers a comprehensive review and reinforcement of the major aspects of German grammar and usage; continues to explore the four major skills of listening comprehension, speaking, reading, and writing; introduces the student to the reading of contemporary literary texts, including a full-length play—*Biedermann und die Brandstifter*, by the Swiss playwright Max Frisch.

LNG 1104 Intermediate German II 4 Q.H.

(Prereq. LNG 1103 or equiv.)

The course aims at helping students enlarge vocabulary and develop increased flexibility in the four basic language skills. Included are completion of grammar review, continued exposure to modern literary texts.

One full-length play is read—*Der Besuch der alten Dame*, by the contemporary Swiss dramatist Friedrich Dürrenmatt. Successful completion of this course entitles the student to choose from among the upper-level course offerings in the areas of German literature and/or composition and conversation.

LNG 1107 Reading German 4 Q.H.

This course is designed for those students who wish to develop their reading skills, without regard to other aspects of the language, such as speaking or writing. The grammar necessary for reading is stressed, together with vocabulary building; scientific and nonscientific texts are read. This course may provide assistance to students, graduate and undergraduate, who need to pass a reading examination to fulfill specific degree requirements.

LNG 1201 German Composition and Conversation I 4 Q.H.

(Prereq. LNG 1104 or equiv.)

This course strives to develop facility in speaking and writing German and stresses active use of the language. Students are provided an opportunity for practice in listening comprehension through German language films or tape-recorded interviews with native German speakers; expansion of vocabulary through guided group discussions on topics of general interest; and development of language skills in areas of individual interest through preparation of oral reports in German. Compositions are assigned on a weekly basis and grammar is reviewed as needed. Utilization of language laboratory. Recommended for students preparing for co-op in Germany.

LNG 1202 German Composition and Conversation II 4 Q.H.

(Prereq. LNG 1201 or equiv.)

Continuation of German LNG 1201 in content and format with emphasis on independent communication skills. Recommended for students preparing for co-op in Germany.

LNG 1203 Advanced German Proficiency I 4 Q.H.

(Prereq. LNG 1201 and LNG 1202, or permission of instructor)

The course offers intensive training in spoken and written German with the aim of providing students an opportunity to increase vocabulary and develop flexibility in the use of the language. Included are student-led discussions of German society and current affairs based on readings of current journals and periodicals; weekly written assignments; review and practice of grammar where necessary.

LNG 1231 Masterpieces of German Literature I 4 Q.H.

The course includes a survey of the major trends in the development of German literature from the Hildebrandslied to Martin Luther. In addition, reading of selected works of major authors of the twentieth century such as Hauptmann, Kafka, Mann, Brecht, Dürrenmatt, and Boll. Choice of works to be read in a particular term will be based partially on theatre per-

formances or film showings planned in the Boston area. Class attendance of these performances is anticipated. Recommended as an introductory step to literature courses LNG 1307 and above. Offered every other year, alternating with LNG 1232.

LNG 1232 Masterpieces of German Literature II 4 Q.H.

(Prereq. LNG 1104 or equiv.) This course includes a survey of the major trends in the development of German literature from Martin Luther to the present, including selected works of major authors of the nineteenth and twentieth centuries. Choice of works to be read in a particular term will be based partially on theatre performances or film showings planned in the Boston area. Class attendance of these performances is anticipated. Recommended as an introductory step to literature courses LNG 1307 and above. Offered every other year, alternating with LNG 1231. May be taken before LNG 1231.

LNG 1307 Classical Period of German Literature 4 Q.H.

(Prereq. LNG 1232 or equiv.) The course provides background and general survey of the period from 1750 to 1800, with particular emphasis on the works of Lessing and Schiller. Among the dramas read are Lessing's *Minna von Barnhelm* and *Nathan der Weise*, and Schiller's *Maria Stuart* and *Die Jungfrau von Orleans*. Lectures (in German) and reports.

LNG 1308 The Works of Goethe 4 Q.H.

(Prereq. LNG 1232 or equiv.) The course includes drama, prose writing, and lyric poetry of Goethe: *Faust*, Part I; *Hermann Und Dorothea*; *Egmont*; and *Iphigenie auf Tauris*. Lectures (in German) and reports.

LNG 1309 German Literature of the Nineteenth Century 4 Q.H.

(Prereq. LNG 1232 or equiv.) The course offers background and general survey of German literature of the nineteenth century, with particular attention to prose and lyric poetry. The lyric poetry includes poems of all the important romantic poets, beginning with Holderlin, Tieck, Novalis, and extending through Morike. Among the prose works discussed are *Novellen* by Eichendorff, Tieck, Chamisso, Kleist, Fougue, Keller, Meyer, and Ludwig. Lectures (in German) and reports.

LNG 1310 German Drama of the Nineteenth Century 4 Q.H.

(Prereq. LNG 1232 or equiv.) Dramas read are selected from Germany's foremost dramatists of the nineteenth century, including Kleist, Hebbel, Grillparzer, and Ludwig. Lectures (in German) and reports.

LNG 1311 German Literature of the Twentieth Century 4 Q.H.

(Prereq. LNG 1232 or equiv.) The course includes lyric poetry and prose works of important German writers of the twentieth century, including Schnitzler, Hauptmann, Mann, and Kafka. Lectures (in German) and reports.

LNG 1312 German Drama of the Twentieth Century 4 Q.H.

(Prereq. LNG 1232 or equiv.)

Plays are selected from those by important dramatists of the twentieth century, including Schnitzler, Hauptmann, Sudermann, Hofmannsthal, Wedekind, Kaiser, Toller, and Brecht. Lectures (in German) and reports.

LNG 1315 The German Lyric 4 Q.H.

(Prereq. LNG 1232 or equiv.)

The course offers a survey of the German lyric from the twelfth century to the present. Analysis and interpretation of representative selections from major lyric poets such as Walther von der Vogelweide, Gerhard, Fleming, Gryphius, Klopstock, Claudius, Goethe, Schiller, Holderlin, Eichendorff, Brentano, Heine, Morike, Storm, Meyer, Rilke, and Brecht. Background of the development of the German lyric, movements, and types. Class discussions and reports.

LNG 1316 The Dramatic Works of Franz Grillparzer 4 Q.H.

(Prereq. LNG 1232 or equiv.)

The course includes reading, analysis, and interpretation of representative works of Franz Grillparzer, Austria's greatest dramatist: *Sappho*, *Des Meeres und der Liebe Wellen*, *Der Traum ein Leben*, *König Ottokars Glück und Ende*, and the novella, *Der arme Spielmann*. Collateral readings, discussions, and reports.

LNG 1801, LNG 1802, LNG 1803, LNG 1804, LNG 1805 Directed Studies (each) 4 Q.H.

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

LNG 1820, LNG 1821, LNG 1822, LNG 1823 Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

Russian

Prerequisites listed for Modern Languages are based on current course numbers at Northeastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

LNR 1101 Elementary Russian I 4 Q.H.

The course includes essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary, idiomatic expressions.

LNR 1102 Elementary Russian II 4 Q.H.

(Prereq. LNR 1101)

Continuation of grammar study; oral and written exercises.

LNR 1103 Intermediate Russian I 4 Q.H.

(Prereq. LNR 1102)

Designed to help further the student's knowledge of Russian through oral and written work; the study of grammar and reading texts of moderate difficulty.

LNR 1104 Intermediate Russian II 4 Q.H.

(Prereq. LNR 1103)

Continuation of work and aims of LNR 1103.

LNR 1107 Scientific Russian 4 Q.H.

(Prereq. LNR 1104 or equiv.)

The course offers readings of Russian texts in mathematics, physics, chemistry, astronomy, biology, and medical science. Designed to help prepare the student for the department reading examination in his/her chosen field. As far as possible, texts are selected on the basis of the students' needs and interests.

LNR 1201 Russian Composition and Conversation I 4 Q.H.

(Prereq. LNR 1104 or equiv.)

Designed to assist students in developing skills in speaking and writing by means of detailed grammar review and extensive use of audio-visual media. Conducted in Russian.

LNR 1202 Russian Composition and Conversation I 4 Q.H.

(Prereq. LNR 1201 or equiv.)

A continuation of LNR 1201 with an increased emphasis on speaking the colloquial Russian idiom. Conducted in Russian.

LNR 1203 Advanced Russian Proficiency I 4 Q.H.

(Prereq. LNR 1202 or equiv.)

Emphasizes speaking and writing skills through the study of Russian word formation and derivation. Weekly compositions or oral reports are required. Conducted in Russian.

LNR 1204 Advanced Russian Proficiency II 4 Q.H.

(Prereq. LNR 1203 or equiv.)

Emphasizes speaking and writing skills through the study and use of Russian idioms and colloquialisms. Conducted in Russian.

LNR 1205 Stylistics and Advanced Grammar Analysis I 4 Q.H.

(Prereq. LNR 1104 or permission of instructor)

Designed for students pursuing a major or minor in the Russian language; focuses on modern usage of the Russian language through newspaper and magazine articles and short stories.

LNR 1206 Stylistics and Advanced Grammar Analysis II 4 Q.H.

(Prereq. LNR 1205 or permission of instructor)

Continues goals of LNR 1205 and also focuses on helping students improve listening comprehension through the use of extensive laboratory work.

LNR 1309 Russian Short Stories of the Nineteenth Century 4 Q.H.

(Prereq. LNR 1104 or equiv.)

The course offers detailed analysis of selected representative short stories read in Russian; study of the development of this genre.

LNR 1315 Russian Expository Prose 4 Q.H.

(Prereq. LNR 1104)

Selected readings of lectures, speeches, essays, and critical studies by outstanding Russian scholars.

LNR 1316 Russian Folklore 4 Q.H.

(Prereq. LNR 1104)

Various genres of Russian folk literature are read in Russian. Readings are supplemented with lectures and tape recordings.

LNR 1317 Russian Poetry 4 Q.H.

(Prereq. LNR 1104)

The major works of important classical and modern poets are read in Russian and analyzed.

LNR 1801, LNR 1802, LNR 1803, LNR 1804, LNR 1805 Directed Studies (each) 4 Q.H.

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

LNR 1820, LNR 1821, LNR 1822, LNR 1823 Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

Italian

Prerequisites listed for Modern Languages are based on current course numbers at Northeastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

LNI 1101 Elementary Italian I 4 Q.H.

For the beginner who wants instruction in the essentials of Italian grammar and the opportunity to practice speaking and reading the language.

LNI 1102 Elementary Italian II 4 Q.H.

(Prereq. LNI 1101 or equiv.)

Continued study of grammar and basic language skills. Practice in more advanced conversation and reading.

LNI 1103 Intermediate Italian I 4 Q.H.

(Prereq. LNI 1102 or equiv.)

Review of grammar. Progressively more intensive practice in oral and written communication. Reading will be from selected modern texts.

LNI 1104 Intermediate Italian II 4 Q.H.

(Prereq. LNI 1103 or equiv.)

Review of grammatical difficulties, with attention given to current idiomatic forms. Greater emphasis on self-expression. Reading of short stories or a modern novel.

LNI 1201 Italian Composition and Conversation I 4 Q.H.

(Prereq. LNI 1104 or equiv.)

For students who have mastered the fundamentals of the language. There will be no study of grammar as such. The course aims at helping students strengthen speaking and writing ability through an analysis of the language, oral and written reports, and general discussions on a variety of topics. Conducted entirely in Italian.

LNI 1202 Italian Composition and Conversation II 4 Q.H.

(Prereq. LNI 1201 or equiv.)

Continuation of LNI 1201, with stress on individual work, free discussions, and compositions. Conducted entirely in Italian.

LNI 1231 Masterpieces of Italian Literature I 4 Q.H.

(Prereq. LNI 1104 or equiv.)

Introductory course in Italian literature covering the *Trecento* to the seventeenth century. An analysis will be made of major trends and writers beginning with the *doice stil nuovo*, Dante's *Vita Nuova*, and continuing with readings from Petrarca's *Canzoniere*, Boccaccio's *Decameron*, and Machiavelli's *La Mandragola*. Discussion of the readings, oral and written reports. Conducted basically in Italian, but students are allowed to express themselves in English.

LNI 1232 Masterpieces of Italian Literature II 4 Q.H.

(Prereq. LNI 1104 or equiv.)

Continuation of LNI 1231, but may be taken separately. This course concentrates on authors from the eighteenth to the twentieth centuries, such as Goldoni, Leopardi, Verga, Pirandello, Moravia, Levi, and Buzzati. A novel, a play, or poetry selections from each author will be discussed. Oral and written reports. Conducted basically in Italian, but students may use English.

LNI 1311 Italian Literature of the Twentieth Century I 4 Q.H.

(Prereq. LNI 1232 or equiv.)

Reading and discussion of some of the novels, plays, and poems from a variety of literary trends and styles that evolved between the turn of the century and World War II. Among the authors studied are Verga, Pascoli, D'Annunzio, Pirandello, Deledda, and Svevo. Oral and written reports. The course will be conducted basically in Italian, but students may use English. Offered in alternate years.

LNI 1312 Italian Literature of the Twentieth Century II 4 Q.H.

(Prereq. LNI 1232 or equiv.)

The postwar period to the present. Many important authors have arisen since the early forties, and their books reflect the preoccupations, moods, and aspirations of our changing times. Among the writers considered in this course are Moravia, Silone, Vittorini, Pavese, Guareschi, Buzzati, Sciascia, Ungaretti, Montale, and Quasimodo. Oral and written reports are required. English may be used, but the course will be conducted basically in Italian. Offered in alternate years.

LNI 1801, LNI 1802, LNI 1803, LNI 1804, LNI 1805 Directed Studies (each) 4 Q.H.

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing

courses. Priority is given to language majors and to juniors and seniors.

LNI 1820, LNI 1821, LNI 1822, LNI 1823

Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

Mathematics

The Mathematics Department offers several sequences of courses which may overlap in content. Please consult the Math Department if you have any question regarding course content. You will not receive credit for two courses which overlap in content.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1 and 2.

MTH 1000 Mathematics Preliminaries I 4 Q.H.

(Prereq. Permission of course coordinator)

The purpose of this course is to supply, together with MTH 1010, the high school math background necessary for a student to survive in MTH 1101, MTH 1106, or MTH 1113. Material includes the arithmetic of signed numbers, fractions, decimals, and percents; algebraic manipulation and solution of simple equations; elementary word problems; laws of exponents.

MTH 1010 Mathematics Preliminaries II 4 Q.H.

The purpose of this course is to supply, together with MTH 1000, the high school math background necessary for a student to survive in MTH 1101, MTH 1106, or MTH 1113. Topics include quadratic equations and systems of equations; graphing (including slope of a line and vertex of a parabola), more word problems; either logarithms, trigonometry, or some of both at the instructor's discretion; in winter and spring quarters the material covered in MTH 1000 will be assumed; in the fall quarter there is an overlap with MTH 1000 on solving equations, word problems, and laws of exponents.

MTH 1101 Basic Mathematics 4 Q.H.

The course examines systems of linear equations and their graphs. Graphing systems of linear inequalities in two variables with application to linear programming. Introduction to matrices, matrix multiplication, and vectors. (I)

MTH 1103 Basic Mathematics 4 Q.H.

Topics include introduction to probability, sample spaces with equiprobable events, permutations and combinations, conditional probability. Random variables, introduction to Markov processes.

MTH 1106 Fundamentals of Mathematics 4 Q.H.

This course examines how to solve various kinds of algebraic equations: linear, quadratic, and linear systems in two and three unknowns. Applications to word problems such as motion, mixture, and variational problems. The concept of function, graphs, line slopes, and graphs of polynomials. Some elementary trigonometry and vectors in the plane.

MTH 1107 Functions and Basic Calculus 4 Q.H.

The course provides an introduction to differential calculus. Elementary rules of differentiation with application to graph sketching and to maximum and

minimum problems. Exponential and logarithmic functions with applications to problems in compound interest, population growth, and radioactive decay. (I)

MTH 1108 Calculus 4 Q.H.

The course offers a review and continuation of differential calculus, graphing and differentiation of trigonometric functions, introduction to integral calculus with applications to geometric problems and to differential equations.

MTH 1113 College Mathematics for Business

4 Q.H.

Topics include sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic functions, systems of linear equations, summations, inequalities, permutations and combinations, elementary probability concepts, arithmetic and geometric progressions, simple and compound interest annuities.

MTH 1114 Fundamentals of Mathematics 4 Q.H.

(Prereq. MTH 1113 or equiv.)

Topics include matrices; Gaussian elimination inverses of matrices; systems of linear inequalities; feasible regions; graphical solution of linear programming problems; limits; derivatives; differentiation of polynomials; differentiation of exponential and logarithmic functions; maxima, minima, and points of inflection; optimization in nonlinear problems; marginal analysis of cost revenue and profit functions.

MTH 1120, MTH 1121 Calculus (each) 6 Q.H.

This course sequence is designed to assist students in overcoming deficiencies in precalculus mathematics without losing ground in the MTH 1123 sequence. The two quarters review high school algebra, introduce trigonometric functions, and cover the material in MTH 1123 and MTH 1124. The five meetings per week include lecture and homework review sessions. Students are placed in this course by request or on the basis of their College Board scores and the results of an orientation-week diagnostic test.

MTH 1123 Calculus 4 Q.H.

This is a first course in calculus in one variable, primarily for engineering students. Functions, graphs, lines, limits, continuity, derivatives, chain rule, curve sketching, related rates, and maxima-minima problems are included.

MTH 1124 Calculus 4 Q.H.

Continuation of MTH 1123. The integral in one variable with applications to areas, volumes, lengths, work, pressure, etc. Trigonometric, exponential, and logarithmic functions.

MTH 1125 Calculus 4 Q.H.

Continuation of MTH 1124. Further techniques of integration, elementary differential equations, polar coordinates, and further applications are included.

MTH 1128 Calculus 4 Q.H.

Continuation of MTH 1124. Further techniques of integration, graphs in two and three dimensions, double and triple integrals, applications.

MTH 1133 Calculus for Biology Majors I 4 Q.H.

This is a first course in calculus with applications to biology, ecology, and medicine. Differentiation, curve sketching, anti-differentiation, and exponential functions are included.

MTH 1134 Calculus for Biology Majors II 4 Q.H.

(Prereq. MTH 1133)

Continuation of MTH 1133. Topics include exponential growth and decay; integration and area; rules for differentiation; and functions of several variables, with LaGrange multipliers, total differentials, and the method of least squares.

MTH 1135 Calculus for Biology Majors III 4 Q.H.

(Prereq. MTH 1134)

Continuation of MTH 1134. Topics include the natural logarithm; trigonometric functions; techniques of integration, including numerical methods and differential equations, with separation of variables and qualitative methods.

MTH 1137 Discrete Mathematics I 4 Q.H.

(Prereq. MTH 1123)

Proof methods: induction, case analysis, contradiction. Binary, octal and hexadecimal numbers. Modular arithmetic. Sets, relations, equivalences, functions. Combinations, permutations, elementary counting, and discrete probability. Elementary graph theory.

MTH 1143 Calculus 5 Q.H.

This course is designed primarily for mathematics, physics, and chemistry majors. Syllabus for MTH 1143 through 1145 includes derivatives and integrals of one-variable functions; applications to curve sketching, maxima and minima problems, area, moments, simple volumes, etc.; approximation methods, including numerical integration, root finding, Taylor series, and power series. Students will also be required to master the use of the computer to make value tables and plot curves and to implement simple numerical algorithms.

MTH 1144 Calculus II 5 Q.H.

(Prereq. MTH 1143)

Continuation of MTH 1143.

MTH 1145 Calculus III 5 Q.H.

(Prereq. MTH 1144)

Continuation of MTH 1144

MTH 1150 Probability, Statistics, and the Computer

(Prereq. Nonmath majors)

4 Q.H.

The course presents a computer-oriented introduction to statistical methods, with applications in the social and life sciences. Topics include descriptive statistics, elementary probability, correlation and regression, and the fundamentals of statistical inference (confidence intervals and hypothesis testing) with a minimum of mathematical derivations. A statistical computer package such as MINITAB or SPSS is used in solving supplementary problems. (I)

MTH 1152 Statistical Thinking 4 Q.H.

An introduction to the statistical style of thinking for students without mathematical sophistication or who ordinarily don't like mathematics. Readings will be assigned from a wide variety of sources. Extensive class discussion and homework problems (some on a computer) will teach the students to use statistics and to critically evaluate the use of statistics by others. Topics include descriptive statistics, statistical tests, confidence intervals, regression, and sampling. (II)

MTH 1160 Introduction to Computers I 4 Q.H.

(Prereq. Nonmath majors)

This course has two goals: (1) to introduce computers and consider their applications, and (2) to introduce computer programming so that the uses and limitations of computers can be discussed intelligently. Small programs will be written and run. Applications such as sorting, searching, data processing, simulation, and artificial intelligence will be covered.

MTH 1163 Introduction to Computers and Computation 4 Q.H.

Course offers an introduction to problem solving with the use of computers. Students are expected to design, write, debug, and test programs in BASIC programming language. Course includes application of programming to a wide variety of problems, including statistical analysis of data, plotting, artificial intelligence, and text processing.

MTH 1172 Introduction to Computer Science 4 Q.H.

This is a second course in programming, dealing with problem solving in the context of computing. Structured programming using PASCAL language. Correctness, clarity, and reliability of programs are stressed. (II)

MTH 1183 Mainstreams of Mathematics 4 Q.H.

This course traces the development of mathematical thought by focusing on some of its most exciting aspects. Individual projects supplement lectures and readings, enabling students with diverse backgrounds to rediscover mathematics. The level is non-technical; no more than high school algebra and geometry is assumed. Topics vary from year to year, but may include mathematical games, a wide variety of puzzles, ancient number systems, logic and computers, calculus and the scientific revolution, art and symmetry. The course may be used to satisfy the math-science distribution requirement but not any major requirements.

MTH 1188 Problem Solving and Pre-Calculus I**6 Q.H.**

The purpose of this six-credit course is to develop basic algebraic and problem-solving skills. Students indicating these needs are enrolled in this course rather than the four-credit MTH 1191. Together with MTH 1189, which follows this course, the goal is to prepare the student for calculus (MTH 1193). Topics include: writing equations and relating word problems to equations; plotting linear equations; word problems involving algebraic fractions; algebraic operations; radicals; inequalities; functional notation and the graphing of functions.

MTH 1189 Problem Solving and Pre-Calculus II**6 Q.H.**

This course is a continuation of MTH 1188. Topics include: functions and graphing; composite functions and inverse functions; logarithmic and exponential functions and equations; trigonometric functions and their graphs; solving trigonometric problems; trigonometric identities; vectors in two dimension.

MTH 1191 College Algebra and Trigonometry I

(Prereq. B.E.T. majors only)

4 Q.H.

Topics include fundamental algebraic operations, complex numbers, radicals and exponents, functions, linear and quadratic equations, irrational equations, inequalities, variation, roots of polynomial equations.

MTH 1192 College Algebra and Trigonometry II

(Prereq. MTH 1191; B.E.T. majors only)

4 Q.H.

Topics include logarithms; trigonometric functions of angles in degrees and radians, trigonometric identities and equations, right triangles, oblique triangles, complex numbers in trigonometric form, systems of equations, determinants.

MTH 1193 Calculus I**4 Q.H.**

(Prereq. MTH 1192; B.E.T. majors only)

Plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivatives of higher order; curve sketching; basics in functions, limits, and continuity. (Not equivalent to MTH 1123)

MTH 1194 Calculus A**4 Q.H.**

(Prereq. MTH 1193; B.E.T. majors only)

Topics include applications of derivatives to curve sketching; antidifferentiation; the definite integral, with applications; calculus of nonalgebraic functions—logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; L'Hospital's rule. (Not equivalent to MTH 1124)

MTH 1195 Calculus B**4 Q.H.**

(Prereq. MTH 1193; B.E.T. majors only)

Topics include polar coordinates, vectors in a plane, calculus of functions of several variables, partial differentiation, multiple integrals, infinite series, vector analysis, introduction to differential equations. (Not equivalent to MTH 1125.)

MTH 1196 Differential Equations**4 Q.H.**

(Prereq. MTH 1195)

Topics include ordinary differential equations—standard types of the first order, linear differential equations, especially with constant coefficients; Laplace transforms; series solutions of differential equations; Fourier series and orthogonal functions.

MTH 1203 History of Mathematics**4 Q.H.**

Topics include development of the various branches of mathematics; lives of outstanding mathematicians; growth of mathematical knowledge and its relation to culture. (III)

MTH 1212 Linear Programming**4 Q.H.**

(Prereq. one year of college mathematics)

Introduction to concepts and techniques of linear programming, game theory, discrete modeling (shortest path, minimum spanning tree). Application to economics, social sciences, and other related fields. (II)

MTH 1221 Mathematical Analysis IV-V**5 Q.H.**

(Prereq. Freshman calculus or equiv.)

This course is designed to help prepare transfer students for numerical analysis and differential equations. Calculus of one and several variables. Linear algebra, vector-valued functions, multiple integration, infinite series, Taylor's theorem, and complex numbers.

MTH 1223 Calculus**4 Q.H.**

(Prereq. MTH 1125)

Topics include solid analytic geometry, vectors in 3-space, partial derivatives with applications, multiple integration.

MTH 1225 Mathematical Analysis**4 Q.H.**

(Prereq. MTH 1128)

This course examines ordinary differential equations, with emphasis on methods of solution. Includes first-order equations, LaPlace transform, second-order linear equations, and systems of first-order linear equations. (Intended primarily for engineering students.)

MTH 1226 Mathematical Analysis**4 Q.H.**

(Prereq. MTH 1225)

Topics include numerical methods for solving ordinary differential equations, Fourier series, and selected partial differential equations by separation of variables. (Intended primarily for engineering students.)

MTH 1227 Calculus**4 Q.H.**

(Prereq. MTH 1128)

Topics include solid analytical geometric, vector methods, parametrized curves, surfaces, partial differential with applications, notions of linear algebra.

MTH 1228 Calculus**4 Q.H.**

(Prereq. MTH 1227)

Topics include infinite series, Taylor series, convergence of power series, Fourier series, approximation methods, various numerical techniques. (Not for ECE students)

MTH 1233 Mathematical Models in the Life Sciences**4 Q.H.**

(Prereq. One year of calculus)

The focus of this course is the derivation and solution of mathematical models in biology, psychology, and the social sciences. Topics may include population dynamics, diffusion processes, pollution control systems, neural networks, and mathematical genetics.

MTH 1237 Discrete Mathematics II**4 Q.H.**

(Prereq. MTH 1137, MTH 1223)

Elementary number and group theory. Introduction to fields. Finite fields. Coding Theory, Hamming and BCH codes. Counting arguments.

MTH 1238 Combinatorial Mathematics**4 Q.H.**

(Prereq. two courses in Calculus)

This is designed to be a transitional course from calculus to more traditional mathematics courses. It explores various techniques for counting, such as permutations, combinations, inclusion-exclusion, Polya enumeration, and the mathematical formulations necessary for these techniques, including elementary group theory and equivalence relations.

MTH 1243 Calculus and Linear Methods I**4 Q.H.**

(Prereq. MTH 1145)

The course focuses on methods of calculus and vector analysis to study curves, surfaces, and functions of several variables. Topics include parameterization of lines and planes, tangents and normal vectors, partial derivatives, maxima and minima problems, linear approximations, and tangent planes. Some linear algebra.

MTH 1244 Calculus and Linear Methods II**4 Q.H.**

(Prereq. MTH 1243)

Continuation of MTH 1243. Topics include multiple integration, line integrals, and exact differentials; various forms of Stoke's theorem; more linear algebra.

MTH 1245 Differential Equations and Linear Methods I**4 Q.H.**

The course focuses on ordinary differential equations and linear algebra. First-order equations, higher-(primarily second-) order linear differential equations, systems of linear differential equations. Linear algebra includes eigenvalues and eigenvectors primarily for two-dimensional systems. Applications of ordinary differential equations.

MTH 1246 Differential Equations and Linear Methods II**4 Q.H.**

(Prereq. MTH 1245)

Topics include analysis of linear partial differential equations (wave equations, heat equation and potential equation). Ordinary differential equations with boundary values. Fourier analysis, orthogonal functions. Also, numerical methods and other topics in ordinary differential equations.

MTH 1301 Linear Algebra I**4 Q.H.**

(Prereq. MTH 1244 or equivalent)

Topics include vectors and vector spaces, including function spaces, subspaces. Lengths, angles, scalar

products; volumes, determinants. Linear independence and dependence, dimension, linear and affine maps, kernel and image. Algorithms: row operations, double triangular form, inversion. Introduction to linear maps. In particular, characteristic polynomials, eigenvalues, and eigenvectors in low dimensions.

Note: Students who have not completed MTH 1143-TH 1246 should inform the course instructor of their backgrounds.

MTH 1302 Linear Algebra II**4 Q.H.**

(Prereq. MTH 1301)

The course focuses on detailed study of linear maps. Part I: Symmetric maps and quadratic forms. Isometries and skew-symmetric maps. Decomposition of general linear maps using symmetric maps and isometries. Part II: Polynomials evaluated on linear maps. Generalized eigenspaces. Jordan form. As time permits, an introduction to computational methods with emphasis both on geometry underlying algorithms and on practical advantages and limitations. A survey of related areas in mathematics in which linear ideas play a role is included.

Note: Upper-level students who have not completed the MTH 1243-MTH 1246 program may take MTH 1301-MTH 1302. Such students should inform the course instructor regarding their particular backgrounds.

MTH 1311 Analysis I**4 Q.H.**

(Prereq. MTH 1246 or permission of instructor)

The course examines the theoretical foundations of calculus: limits, measure, continuity, and related concepts. Analysis I and II are intended to serve as a bridge between the MTH 1243-MTH 1246 calculus sequence and the more advanced analysis courses, such as MTH 1347-MTH 1348, MTH 1351, and MTH 1370-MTH 1371.

MTH 1312 Analysis II**4 Q.H.**

(Prereq. MTH 1311)

Continuation of MTH 1311. The course focuses on calculus, applying the concepts introduced in Analysis I.

MTH 1321 Introduction to Groups and Their Applications**4 Q.H.**

Topics include examples of groups (symmetry groups, permutation groups, matrix groups, cyclic groups) and their subgroups. Finite groups and orders of subgroups. Homomorphisms and normal subgroups. Applications to some of the following, depending on time and interest: geometry, number theory, crystallography, physics, and combinatorics.

MTH 1322 Topics in Rings, Fields, and Number Theory**4 Q.H.**

Topics include algebraic properties of the integers and rational, real, and complex numbers. Commutative rings, ideals, integral domains, and other quotient fields. Polynomial rings. Quadratic extension fields. Gaussian integers. Other topics as time permits.

MTH 1327 Optimization and Mathematical Game Theory **4 Q.H.**

(Prereq. Some linear algebra, e.g., MTH 1301; or permission of instructor.)

Topics include convex sets in Euclidean n -space, linear and nonlinear programming, zero-sum games, dynamic programming. Students are encouraged to program selected solution methods for a computer.

MTH 1330 Number Theory **4 Q.H.**

(Prereq. MTH 1301 or permission of instructor)

An introduction to the elementary methods of analytic number theory, this course focuses on divisibility, congruences, arithmetical and multiplicative functions, quadratic reciprocity, and equivalent formulations of the prime number theorem.

MTH 1337 Foundations of Mathematics **4 Q.H.**

This course studies the following topics and the shifts in perspective that their development brought about: (1) the disputes over the basis for calculus; (2) twentieth-century discoveries in mathematical logic; and (3) the advent of the computer. (V)

MTH 1338 Foundations of Mathematics **4 Q.H.**

Course material includes set theory; rules for set formation; the axiom of choice and its role in mathematics; transfinite cardinal and ordinal numbers and their arithmetic; axiomatizations of set theory.

MTH 1347 Applied Analysis **4 Q.H.**

(Prereq. MTH 1246 or permission of instructor)

Selected topics are chosen to demonstrate the application of mathematics to interesting physical and biological problems. Methods chosen from ordinary and partial differential equations, calculus of variations, Laplace transforms, singular perturbations, special functions, dimensional analysis, and other techniques of applied mathematics.

MTH 1348 Applied Analysis **4 Q.H.**

(Prereq. MTH 1347)

Continuation of MTH 1347.

MTH 1349 Numerical Analysis **4 Q.H.**

(Prereq. Two years of calculus and one course in programming)

This is a computer-oriented introductory course with emphasis on appreciation of the difference between the theoretical existence of a solution and its numerical calculation. Topics covered: systems of linear equations, nonlinear equations, interpolation, and approximation of functions. Students are required to program and analyze problems on a computer.

MTH 1350 Numerical Analysis **4 Q.H.**

Continuation of MTH 1349. Topics include numerical differentiation and integration, solution of ordinary differential equations, and other topics as time permits.

MTH 1351 Functions of a Complex Variable I

(Prereq. MTH 1243 or equiv.) **4 Q.H.**

Topics include algebra and geometry of complex numbers; concepts of limit, continuity, and derivative in the complex domain; holomorphic functions, series, contour integration. Applications.

MTH 1352 Functions of a Complex Variable II

(Prereq. MTH 1351)

4 Q.H.

Continuation of MTH 1351. Further topics may include conformal mapping, analytic continuation, Riemann surfaces, the Laplace transform and inverse transform, elliptic functions, applications.

MTH 1367 Geometry**4 Q.H.**

This course provides a careful look at classical Euclidean geometry, Hilbert's axioms for geometry, and models; geometries of Bolyai-Lobachevsky.

MTH 1370 Recent Ideas in Geometry**4 Q.H.**

(Prereq. MTH 1312 and MTH 1302, or permission of instructor)

Topics chosen by the instructor may vary each year. Topological classification of surfaces, theory of critical points and singularities of mappings, topological study of vector fields, knot theory, graph theory, differential geometry of surfaces, algebraic curves, homotopy.

MTH 1371 Recent Ideas in Geometry**4 Q.H.**

(Prereq. MTH 1370)

Continuation of MTH 1370.

MTH 1387 Probability I**4 Q.H.**

(Prereq. MTH 1223 or 1244)

Topics include probability functions for finite and infinite spaces; conditional probability and independence; discrete and continuous probability distributions for one or more random variables, expectation; moments; binomial, Poisson, and normal distributions; central limit theorem.

MTH 1388 Probability II**4 Q.H.**

(Prereq. MTH 1387)

Selected topics are studied, including introduction to stochastic processes, with emphasis on Poisson processes and Markov chains.

MTH 1390 Mathematical Statistics**4 Q.H.**

(Prereq. MTH 1387)

Topics include estimation of parameters, confidence intervals, hypothesis testing, regression, sampling distributions. Introduction to analysis of variance and statistical decision theory.

MTH 1392 Multivariate Statistics**4 Q.H.**

(Prereq. MTH 1390)

The course examines methods of classification, estimation, and prediction based on several statistical variables.

MTH 1407 Introduction to Analysis of Algorithms**4 Q.H.**

(Prereq. MTH 1245)

The course offers theoretical study of algorithm design, evaluation of algorithms, and other algorithmic concepts and techniques useful for computer programming. Topics include graph and matrix algorithms, testing primeness, factoring; evaluating greatest common divisors, linear Diophantine equations; evaluating square roots, logarithms, exponentials, etc.; truncation and round-off errors; random number generation; information organization and retrieval; sorting.

MTH 1411 Automata Theory and Formal**Languages****4 Q.H.**

(Prereq. COM 1130 and COM 1201 or equiv.)

Topics include finite-state machines and regular expressions, context-free grammars. Parsing of context-free languages. Context-sensitive grammars, push-down stores, stack machines and linear-bounded automata. Turing machines, undecidability, description of computation using list structures, program machines, and programs.

MTH 1412 Artificial Intelligence**4 Q.H.**

(Prereq. COM 1201 or equiv.)

The course provides analysis of current computer programs dealing with problems such as theorem proving, chess playing, general problem solvers, robotics, symbolic computation, preceptrons, self-reproducing automata, and parallel machines.

MTH 1801-MTH 1809 Directed Study**4 Q.H.**

(Prereq. Permission of instructor)

Programs of directed study, held one or more quarters, are available for highly motivated students who

wish to explore mathematical situations and theories in depth. Directed study can be used as an opportunity to examine familiar material in fresh ways or to explore new material that is not offered in formal courses. It is hoped that directed study programs will provide students strong in mathematics and the related sciences a chance to develop the art and skill needed to work independently and creatively in mathematics.

Note: Students strong in mathematics are permitted to enroll in graduate courses in mathematics.

Honors Program:

MTH 1714, MTH 1723, MTH 1724, MTH 1725, MTH 1733, MTH 1734, MTH 1735 (each 4 Q.H.) and MTH 1743, MTH 1744, and MTH 1745 (each 5 Q.H.)

Special sections for Honors students of courses: MTH 1114, MTH 1123, MTH 1124, MTH 1125, MTH 1133, MTH 1134, MTH 1135, MTH 1143, MTH 1144, and MTH 1145, respectively.

Music

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

MUS 1100 Introduction to Music**4 Q.H.**

This course offers an introduction to selected works of our Western musical heritage, from earliest to contemporary styles. It is primarily a survey and listening course, with emphasis on styles, basic theory, forms, and the historical, social, and artistic periods which these works represent. (II)

MUS 1101 Music as a Listening Experience**4 Q.H.**

This introduction-to-music course is listening-oriented and has been designed to provide tools for the aural appreciation of music. No previous musical knowledge is required or assumed, and studies deal directly with compositions selected from the masterpieces of music. Organized according to the tenets of PSI (Personalized System of Instruction), the course allows the student to proceed at his or her own pace under the constant guidance and supervision of the instructor. Grades are determined by the number of units completed. (II)

MUS 1102 Music in Concert**4 Q.H.**

In this course students have the opportunity to develop musical understanding through the study of music that is performed today in concerts by major symphony orchestras in the United States and throughout the world. Study materials are selected from actual symphony concert programs.

MUS 1103 Music as a Means of Social Expression**4 Q.H.**

The course deals with the artist's involvement with recurring social themes of the human self-image, the search for peace and understanding, society's treatment of minority groups, and sex roles. Paintings and literary works are examined, in addition to works by composers such as Beethoven, Schönberg, Britten, and jazz. (III)

MUS 1104 Survey of African-American Music**4 Q.H.**

Black music has evolved in fascinating ways over the past several hundred years. Topics include the impact of African rhythm on American black music, the New Orleans coalescence, regional developments, ragtime, the emergence of big bands, the harmonic revolution of the 1940s, bebop, the 1960s avant-garde, and subsequent developments. Also examined are the contributions of black composers such as William Grant Still, Ulysses Kay, and George Walker. This is the same course as AFR 1153.

MUS 1105 Music of the U.S.A.**4 Q.H.**

This course examines American music from the time of Puritan psalm singing to the present. A wide variety of music will be covered, including concert music, traditional folk music, jazz, and contemporary styles.

MUS 1106 Women in Music 4 Q.H.

This course examines the multi-faceted role of women in music from the Renaissance through to the present. For centuries women have been active and influential patrons, composers, teachers, conductors, and performers in Europe and America. Their contributions to classical and popular music and to jazz will be examined with emphasis on such widely varying figures as Queen Elizabeth I, Elizabeth Jacquet de la Guerre, Fanny Mendelssohn Hensel, Clara Schumann, Mrs. H. H. A. Beach, Germaine Tailleferre, Billie Holiday, Carla Bley, Ruth Crawford Seeger, Pauline Oliveros, Sarah Caldwell, Antonia Bríco, and Nadia Boulanger.

MUS 1107 Principles of Music 4 Q.H.

This course will examine the evolution of each major structural element of music through a historical perspective. Also, an attempt will be made to link larger categories of music such as classical, popular, and non-Western by examining their common elements. Required of all Music majors.

MUS 1110 Music in Popular Culture

This course deals with the nature of music composed for the mass market. Techniques of recording and merchandising music are discussed, and selected songs are analyzed for their musical content. The evolution of various styles will be traced including ragtime, jazz, blues, and rock.

MUS 1111 Rock Music 4 Q.H.

This course examines the development of rock'n'roll and its relationship to blues, rhythm and blues, country, folk and other styles of music. Themes to be considered include the role of rock as youth music, the reflections of social realities in rock songs, the relationship of rock to the recording industry and the mass media, and the changing styles of rock; additional emphasis on listening skills.

MUS 1112 Jazz 4 Q.H.

The course focuses on jazz from its origins in New Orleans to the avant-garde experiments of today. The rhythmic, harmonic, instrumental, and stylistic characteristics of jazz are analyzed. Attention is given to the works of creative jazz artists such as Armstrong, Beiderbecke, Parker, Ellington, and Coltrane.

MUS 1113 The New Jazz 4 Q.H.

The course offers an in-depth study of various recorded works of important jazz performers/composers with respect to their works as creative artists: Armstrong, Beiderbecke, Ellington, Coltrane, Miles Davis, etc. The study is not chronological but deals rather with the dynamics of artistic growth and change. Special attention is given to the developments of the last decade.

MUS 1120 Topics in Music History 4 Q.H.
(Prereq. MUS 1201)

This course provides a chronological view of Western music, while examining the role of music in society and exploring the contributions of influential composers. Representative works from each period are discussed, including music by composers such as

Machaut, Josquin, Bach, Handel, Mozart, Haydn, Beethoven, Berlioz, Wagner, Mahler, and Stravinsky.

MUS 1121 Medieval and Renaissance Music**4 Q.H.**

This course offers an introduction to European music from the sixth through the sixteenth centuries. A wide variety of music is covered, ranging from the serene elegance of sacred Gregorian chant and the plaintive love songs of the medieval troubadours to the lively dances and humanistic vocal music of the renaissance. Representative works by composers such as Machaut, Landini, Josquin, Palestrina, and Dowland will be examined.

MUS 1122 Music of the Baroque Era**4 Q.H.**

This course focuses on music of the seventeenth and early eighteenth centuries in Italy, Germany, France, and England. The emergence of important new genres (such as opera, sonata, and concerto) is discussed, and representative works of major composers (such as Bach, Handel, Corelli, Vivaldi, Rameau, and Purcell) are examined.

MUS 1123 Music of the Classical Era**4 Q.H.**

This course focuses on crucial developments in musical styles and forms of the late eighteenth century and on emerging genres, such as the symphony, the concerto, and the string quartet. Emphasis is placed on the vocal and instrumental works of Haydn and Mozart and on the early works of Beethoven.

MUS 1124 Music of the Romantic Era**4 Q.H.**

This course focuses on romantic realism and idealism as expressed in the music of the nineteenth century. Emphasis is placed on historical, nationalistic, and literary influences. Included are composers such as Beethoven, Schumann, Schubert, Berlioz, Liszt, Verdi, Wagner, Brahms, Tchaikovsky, and Mahler. (V)

MUS 1125 Twentieth-Century Music**4 Q.H.**

This course focuses on developments in music from 1900 to the present. A broad range of musical styles will be examined, including impressionism, expressionism, neo-classicism, and other major trends in music of the twentieth century. (V)

MUS 1126 New Directions in Music**4 Q.H.**

Music from 1950 to the present has changed more radically than during any other era in history. This course examines new elements in classical and popular music and focuses on the relationship between the two styles.

MUS 1130 The Symphony**4 Q.H.**

This course offers a study of the symphony as a major genre in the classical, romantic, and contemporary periods. Included are works by composers such as Haydn, Mozart, Beethoven, Schumann, Tchaikovsky, Brahms, Sibelius, and Prokofiev.

MUS 1131 Piano Music: The Great Composers and Performers**4 Q.H.**

This course will give students the opportunity to hear and analyze some of the greatest works for piano,

performed by some of the world's greatest performers. In addition to recordings by internationally acclaimed artists, live performances by guest artists from the Boston area will be presented in class.

MUS 1132 Introduction to Opera 4 Q.H.

This course offers an analysis of opera as a dramatic genre. Aria, recitative, ensemble, and other basic elements of opera are isolated and discussed. Number opera, music drama, and Singspiel are some of the types of opera considered. Included are composers such as Mozart, Wagner, Verdi, and Puccini.

MUS 1133 Great Choral Literature 4 Q.H.

This course provides an analysis of sacred and secular choral literature from medieval to contemporary times.

MUS 1134 Music and Poetry 4 Q.H.

This course will examine the art of setting words to music. It will confront the aesthetic problems encountered in a synthesis of two different art forms. That synthesis will then be examined in selected songs, choral works, tone poems, and operas of diverse periods and styles (classical, folk, and popular).

MUS 1135 Traditional Folk Music of the United States 4 Q.H.

This course focuses on the major folk music traditions of North America and their origins in Europe and Africa. Emphasis is also given to related ethnic dances, epics, and rituals.

MUS 1140 Mozart 4 Q.H.

Mozart's musical development from child prodigy to mature artist is traced from personal letters and biographies. Many of his major compositions, including symphonies, concertos, operas, and chamber works are analyzed.

MUS 1142 Stravinsky 4 Q.H.

This course focuses on the life and works of Igor Stravinsky, the man who has been perhaps the most influential of all twentieth-century composers. Important works (such as *The Rite of Spring*, *Symphony of Psalms*, *The Rake's Progress*, and *Agon*) will be selected from each of his major stylistic periods, and his contributions to twentieth-century musical style will be assessed.

MUS 1144 Debussy and the Music of Paris

4 Q.H.

Claude Debussy, impressionist in sound, composed music that marked a turning point toward modern trends. This course covers much of his music for piano, orchestra, and voice, including *Suite Pour le Piano*, *Suite Bergamasque*, *Images* (for piano and orchestra), *Nocturnes*, *La Mer*, and *Pélleas et Mélisande*. The music of Satie, Ravel, and Fauré, as it relates to that of Debussy, will also be discussed.

MUS 1145 Beethoven 4 Q.H.

This course analyzes the complex personality and art of Beethoven, his relation to the turbulent times in which he lived, and his role in classical and romantic music. (III)

MUS 1146 George Gershwin

4 Q.H.

A study of the life and works of George Gershwin (1898-1937), including popular song, musical comedy, opera, and orchestral compositions. A primary goal of the course is understanding the relationship of George Gershwin to his times, both musically and historically; it will take as a critical starting point Gershwin's famous statement: "My people are American; my time is today."

MUS 1161 Music Therapy

4 Q.H.

The course examines the application of music as a therapeutic vehicle to release suppressed emotions, to encourage self-expression in psychiatric patients, and to treat a wide variety of disorders. Music therapy, in a modern approach to health services, is currently being considered as a supplement to other treatments.

MUS 1162 Music Therapy II

4 Q.H.

(Prereq. MUS 1161)

This course examines the etiologies, characteristics, and applications of music therapy with the physically handicapped, hearing impaired, visually impaired, learning disabled, emotionally disturbed, speech/language impaired, and geriatric populations in one-to-one and group settings. In addition, improvisations and appropriate music materials for the nonmusician and adapted instrument designs tailored to each disability are studied, while the correlation of music and movement is explored. Comparison of various musical therapy approaches is included, and field trips to musical therapy sites in and around Boston will be taken.

MUS 1165 The Music Industry

4 Q.H.

This course will examine business-related areas of the music industry. Included will be topics such as the make-up and structure of the record industry and music publishing world, the function of performing rights organizations (ASCAP and BMI), and the role of concert and orchestral managers. Guests from the various fields will be invited to lecture in class, and trips to "behind the scenes" locations will be arranged.

MUS 1170 Music and Technology

4 Q.H.

A study of the applications of contemporary technology to music. Topics to be discussed include basic acoustics, analog and digital recording techniques, computer sound synthesis, and the aesthetics of electronic music. There are no prerequisites in physics or music theory for Music 1170; however, projects and paper assignments will take into consideration the particular backgrounds of individual students.

MUS 1180 Introduction to World Music

4 Q.H.

An introduction to music from around the world through the study of selected art and folk musics (excluding European art music). Listening skills and an understanding of the role of music in society will be emphasized.

MUS 1181 Music of Africa 4 Q.H.

The music of Africa is as varied as that continent's many linguistic and tribal identities. This course will provide a broad survey of the musical traditions of Africa with respect to their historical, social, and cultural backgrounds. Musical organization, musical practice, and aspects of style will all be discussed in light of possible contributions to contemporary African-American music.

MUS 1182 Music of the Middle East 4 Q.H.

This course is an introduction to the music of selected Near Eastern and Arab cultures (such as Persian in the East and Ethiopic and Berber in Africa). The cantillation styles and practices of various chants of the Hebrew, Christian, and Islamic traditions are also included.

MUS 1183 Music of East Asia 4 Q.H.

This course will introduce the student to the musical heritage of East Asia by examining music history, the relationship of music cultures to each other, the organization of musical sounds, and music as an aspect of culture. There will be an emphasis on developing basic listening skills.

MUS 1184 Music of Latin America and the Caribbean 4 Q.H.

This course will examine the highly diverse and unique musical practices of Latin America and the Caribbean. Emphasis will be on music's role as an adjunct to religious and social practices, as well as how it has been influenced by European, Native American, and African music.

MUS 1200 Learning to Read and Write Music 4 Q.H.

This is a basic course for those who want to learn how to read music or how to write a tune. Students have the opportunity to learn to sight-read music and to compose in some of the basic forms (song, theme and variation, etc.). Credit given for either MUS 1200 or 1201. A student may not receive credit for both courses (overlapping material).

MUS 1201 Fundamentals—Music Theory I 4 Q.H.

This course, the first in the theory sequence, offers the student the opportunity to learn simple melodic and rhythmic dictation skills; to recognize and build scales, intervals, and triads; and to sing at sight simple tonal melodies. A noncredit, ear-training lab will be required. (II)

MUS 1202 Theory II 4 Q.H.
(Prereq. MUS 1201)

This course focuses on harmonic practices in tonal music. The role and function of harmony will be examined through analysis of musical examples and composition of four-voice chorales. A noncredit, ear-training lab will be required.

MUS 1203 Theory III 4 Q.H.
(Prereq. MUS 1202)

This course is a continuation of Theory II and focuses

on aspects of chromatic harmony. Subjects to be discussed include the construction and function of borrowed chords, altered chords, and non-diatonic harmony. A noncredit, ear-training lab will be required.

MUS 1204 Theory IV 4 Q.H.
(Prereq. MUS 120)

This course introduces the student to methods of musical analysis. Topics include the phrase, periodicity, tension-repose, and other structural factors of musical compositions. A noncredit, ear-training lab will be required.

MUS 1230 Chorus 1 Q.H.
(Prereq. Permission of the instructor)

Students participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit.

MUS 1231 Band 1 Q.H.
(Prereq. Permission of the instructor)

Students participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit.

MUS 1232 Orchestra 1 Q.H.
(Prereq. Permission of the instructor)

Students participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit.

MUS 1233 Early Music Players 1 Q.H.
(Prereq. Permission of the instructor)

Students participate as performers in one or more ensembles under the direction of a faculty coach. May be repeated for credit.

MUS 1240 Historical Instruments Workshop 4 Q.H.

This course is for those who wish to learn to play a medieval, Renaissance, or baroque instrument. In addition to teaching basic skills on instruments such as recorder, flute, crumhorn, viola da gamba, vielle, cornetto, and harpsichord, the course will provide opportunities for developing proficiency in music reading and ensemble playing.

MUS 1241 Piano Class I 4 Q.H.

This course is an introductory level study of piano designed for college students with or without previous experience. The course combines skills in reading music with improvisation and functional piano. Some basic theory is introduced to help clarify the structure of class repertoire. The system allows each student to progress at his or her own pace. Grades are determined by the amount of repertoire mastered during the quarter.

MUS 1242 Piano Class II 4 Q.H.
(Prereq. MUS 1241)

This course is a continuation of the skills developed in Piano I, with emphasis on increasing students' flexibility at the keyboard through the study of scales, transposition, and modulation.

MUS 1244 Voice Class I 4 Q.H.

(Prereq. Permission of instructor)

Students will have the opportunity to learn the basic vocal production required for fine singing. Repertoire, both classical and contemporary, will be chosen for each student to learn and perform in lessons and before the entire class. Lectures will be given on the following subjects: diction, the physiology of singing, resonance, registers, and interpretation. Students will also study the basics of music reading and sight-singing. Some interpretation will be discussed, and recordings of the greatest vocal artists will be played for class analysis.

MUS 1247 Guitar Class I 4 Q.H.

This course is an introduction to the fundamentals of classical guitar playing for those with or without prior knowledge of the guitar. Music reading and theory are introduced. Students perform alone and in ensemble with other members of the class. The syllabus is augmented by live performances from outside professional and student classical guitarists. Final grades are based on several written examinations and student performance.

MUS 1301 Form and Analysis I 4 Q.H.

(Prereq. MUS 1204)

Through the examination of representative examples, the student will become familiar with the structural principles governing the melodic, harmonic, rhythmic, and formal components of music. This course will focus on music from the sixteenth to the mid-nineteenth centuries.

MUS 1302 Form and Analysis II 4 Q.H.

(Prereq. MUS 1301)

This course is a continuation of Music 1301. The student will examine works from the late nineteenth century to the present. Selected readings by prominent twentieth-century theorists will also be included.

MUS 1461 Applied Music Lessons 3 Q.H.

(Prereq. Permission of instructor and department chairman)

Advanced individual instruction in voice or on modern and early instruments. May be repeated for credit. This course is available only to upperclass students concentrating in Music Literature and Performance.

MUS 1800, MUS 1801, MUS 1802, MUS 1803, MUS 1804, MUS 1805 Directed Study

(each) 4 Q.H.

The focus of this course is independent work in a selected area of music under the direction of one member of the department. Enrollment is limited to qualified students by special arrangement with the supervising faculty member and with the approval of the department chairman.

MUS 1810, MUS 1811, MUS 1812 Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

INT 1100 Introduction to Art, Drama, and Music 4 Q.H.

This interdisciplinary course offers an integrated approach to three related disciplines: art, drama, and music. Basic vocabulary and analytical techniques are established for each discipline, emphasizing such common elements as color, line, rhythm, texture, and form. Representative works from various periods are examined in the context of the cultures that produced them, and lectures focus on parallels and contrasts among the three disciplines' manifestations of specific trends, principles, and ideals. Lectures, readings, and listening assignments are supplemented by visits to art galleries and attendance at concerts and theatrical performances. (II)

INT 1110 American Musical Theatre 4 Q.H.

This interdisciplinary course, offered by the departments of Drama and Music, traces the development of the American musical from works such as *The Black Crook* to the present. The role of musical theatre as both entertainment and serious art form is considered through an examination of script, score, dance, and design. Works by composers and lyricists such as Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter are studied.

A limited number of qualified students will be able to take selected courses at the New England Conservatory of Music. Regular academic credit will be granted. For information, contact the chairman of the NU Dept. of Music.

Philosophy and Religion

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

PHL 1100 Introduction to Philosophy 4 Q.H.

The course seeks to introduce students to philosophy by acquainting them with the theories and arguments of classical and contemporary philosophers

and by teaching the skills of constructing and analyzing arguments. Students both learn about and engage in philosophical inquiry. While not all sections treat the same issues, typical areas covered

include questions about the basis of morality, free will versus determinism, the existence of God, the problem of suffering, and the nature of knowledge. (II)

PHL 1110 Introduction to Religion 4 Q.H.

This course seeks to identify and appraise different ways of being religious: primitive, mystical, dogmatic, and ritual. Emphasis is placed upon appreciating the unique standpoint that each requires, how each sees the world in a radically different way, and how that leads to distinctive ways of life. (II)

PHL 1115 Understanding Religious Man 4 Q.H.

This course examines several important explanations of the nature, origin, and present significance of religious experience, beliefs, and practices in the light of modern knowledge and attitudes.

PHL 1130 Ethics: East and West 4 Q.H.

Is there a best way to live? Is there a way a human being should live? In both Eastern and Western philosophy there are claims that a way of life exists that leads to happiness, power, and wisdom. This course explores this claim by studying the thought of such philosophers as Socrates, Buddha, Plato, Aristotle, Lao Tzu, Epictetus, Marcus Aurelius, Aquinas, and Spinoza, as well as by studying some of the classical Hindu and Buddhist texts. (V)

PHL 1135 Philosophical Problems of Law and Justice 4 Q.H.

This course focuses on two general questions: What is the proper scope of the law? And how should the law be enforced? Under the first question, a number of issues are dealt with: whether the law has a legitimate right to restrict such activities as the use of drugs, deviant sexual practices, or gambling. Topics included in the second question are the justification of punishment, rehabilitation as an alternative to punishment, and the death penalty.

PHL 1140 Social and Political Philosophy 4 Q.H.
(Prereq. 4 Q.H. philosophy)

A consideration of basic questions about the nature of the state and the relationship of individuals to the state. What basis is there for individuals to obey the laws of the state? What conditions must a government meet to be legitimate? What justification can be given for democratic forms of government? What sorts of controls should the state exert over citizens? What benefits do citizens have a right to expect from the state? Readings will include both classical and contemporary sources. (V)

PHL 1145 Technology and Human Values 4 Q.H.

The course examines the changing values of the modern, technologically advanced world. Our study attempts to increase our understanding of the supposed breach between the literary and scientific cultures, the diverse approaches toward their reconciliation, and the human dimensions of science and technology. Other relevant topics are the neutrality of technology with respect to good or evil uses, technology as an instrument for human liberation, and the issue of proper and effective modes of controlling

technology in today's world. Pirsig's widely read paperback, *Zen and the Art of Motorcycle Maintenance*, is studied, as is Lynn White's *Dynamo and Virgin Reconsidered*. Other important writers to be considered include Kurt Baler, Jacob Bronowski, Barry Commoner, Erich Fromm, Karl Marx, and C. P. Snow. (VI)

PHL 1150 Technology and the Individual 4 Q.H.

This introductory course attempts to awaken some philosophical reflectiveness regarding the potential benefits and threats to individuals that derive from technological change. The course explores and discusses such issues as the relation of technology to human freedom and privacy, the effects of "future shock" upon the individual, the possibility of the tyranny of a technological elite, and the prospects for the transformation of humankind. Some writers see technology as the salvation of humanity; others see technology leading to dehumanization, a decrease of freedom, and a developing sense of alienation; still others see the extinction of "human nature" as we once knew it. Where is the truth in all of this? What are the social, psychological, and philosophical meanings and consequences of technological change in our day and in the future? Some of the major readings for the course are from Alvin Toffler's *Future Shock*, Herbert Marcuse's *One Dimensional Man*, Jacques Ellul's important criticism *The Technological Society*, and Lewis Mumford's *The Transformation of Man*.

PHL 1155 The Ethics of Human and Animal Experimentation 4 Q.H.

This course explores the conflicts that arise between the value of free scientific inquiry on the one hand, and the rights, vulnerabilities, and suffering of human and animal subjects on the other. Topics include traditional issues involving informed consent, voluntariness, coercion, experimental design, risk-benefit analyses, institutional review boards, and professional guidelines, as well as such less traditional issues as the competing conceptions of progress, whether we have obligations to nonhuman animals, and what, if anything, justifies us in treating nonhuman animals in ways in which we know we should not treat human animals.

PHL 1160 Ethical Issues of Taxation 4 Q.H.

Although we tend to believe that persons have a right to their own labor, a right to their own property, and a right to exchange their labor or property for the labor or property of other consenting adults, it seems that income taxes, property taxes, and sales taxes violate these rights. This course explores two basic questions: Is any taxation morally justified? Are there moral grounds for choosing among taxation policies? Specific topics include competing conceptions of private property; the "progressive versus regressive taxation" controversy; the "flat tax" controversy; the alleged problems with interpersonal utility comparisons; and questions involving the distribution of tax monies, e.g., whether those who have more than they need have any moral obligation to provide for the needs of the poor. (VI)

PHL 1165 Moral Problems in Medicine 4 Q.H.

This course examines two fundamental ethical systems, one of which is grounded on the dignity of the person, the other on the intrinsic value of happiness. The course then explores the difficult issues of euthanasia, suicide, paternalism, medical experimentation, the patient's right to consent to any therapeutic intervention, and the concept of death with dignity. After studying these and related moral issues, the larger economic and policy issues of justice, some of which are current in political debates, are examined (for example: Is there a right to health care?). It is hoped that this course will encourage the student to become more sensitive to moral problems as they arise in medical settings, better able to deal with these troublesome issues, and perhaps to be more courageous in facing them if that becomes necessary. The course also offers an investigation into the questions of abortion, euthanasia, infanticide, genetic counseling, psychosurgery, and human experimentation from the standpoint of both philosophical ethics (such as the theory of the end justifying the means) and religious ethics (such as the natural law theory of the Roman Catholic Church).

PHL 1200 Introduction to Logic-1* 4 Q.H.

A practical introduction to the logic of propositions and the syllogism. Principles of critical reasoning and fallacies. Practice in applying logical techniques to the creation and criticism of argument. (II)

PHL 1203 Introduction to Logic-2* 4 Q.H.

Further study of the techniques of logic in the analysis and creation of argument. The logic of predicates, quantifiers, and relations. Practice in applying these techniques to natural arguments. Consideration of the forms of definition and the evaluation of empirical generalizations. (II)

PHL 1215 Symbolic Logic* 4 Q.H.

The course offers a presentation of the syntax and semantics of propositional logic and first order quantification theory. Relations between these systems and natural language are considered. The course covers analysis of the notion of derivation within a system and the notion of logical consequence, and practice in analyzing logical structure in natural language sentences. (II)

PHL 1225 Ancient Philosophy 4 Q.H.

An exploration of classical Greek philosophy, the course starts with a study/discussion of the roots of Western thought in the sixth century B.C. and argues the reasons for our debt to these original thinkers who were concerned with explaining the principles of external nature and the problems of human knowledge and conduct. Central to understanding these problems is the study of Socrates and his adversaries, the Sophists, and the two major figures he influenced: Plato and Aristotle. The course also covers

Roman philosophy, the Stoics, and the Sceptics, who are a prelude to the early Christian philosophers of the first century A.D. Throughout the course, attention is placed upon the interplay between the philosopher and the moral, social, and religious context in which his thought arises. Student participation in class discussion is very important to the course. (III)

PHL 1230 Modern Philosophy 4 Q.H.

(Prereq. 8 Q.H. philosophy)

The 100 years between 1650 and 1750, sometimes called "the century of genius," were a period in which philosophers reacted to the new scientific discoveries of Copernicus, Kepler, and Galileo. Out of this reaction came new ways of thinking about the nature of knowledge and the nature of the world itself. The course focuses on the development of the rationalist and empirical philosophies during this period, with emphasis on Descartes, Leibniz, Spinoza, Locke, Berkeley, and Hume. (III)

PHL 1243 Existentialism 4 Q.H.

(Prereq. 4 Q.H. philosophy)

Existentialist philosophy is examined in its greatest representatives, such as Kierkegaard, Nietzsche, Dostoevski, Heidegger, Jaspers, and Camus, with major attention given to Jean-Paul Sartre and Maurice Merleau-Ponty. The focus of this course will be on central themes, including self-alienation, unauthenticity, authenticity, and existential experiences. Existential philosophy is examined in its historical, social, and cultural relations, and in its influence on psychology, psychoanalysis, sociology, political science, and literature, both in Europe and in the United States.

PHL 1245 Analytic Philosophy 4 Q.H.

(Prereq. 8 Q.H. philosophy)

The development of the analytic movement from its beginnings in the early works of Moore and Russell. Some treatment of Russell's logical atomism, the logical positivists, the thought of Ludwig Wittgenstein, and their widespread influence.

PHL 1250 Chinese Philosophy 4 Q.H.

This course offers a study of Chinese philosophy in the ancient period (until 221 B.C.). Emphasis is placed on Confucianism, Taoism, and the *I Ching*. Less emphasis will be placed on the Logicians, the Mohists, and the Legalists.

PHL 1255 Indian Philosophy 4 Q.H.

In this course we examine the two classical Indian philosophical systems of Hinduism and Buddhism. In examining Theravada Buddhism, we explore the view that it is possible for us to live without anxiety or suffering if we overcome our ignorance of reality and master our desires. Next, we turn to Mahayana Buddhism, focusing on its ethics of compassion and its related metaphysics of "voidness." In this part of the course, we examine questions which, in the West, are thought of as questions about personal identity and the nature of the self. In exploring Hinduism, we study Vedic mysticism as it comes to us through the Upanishads, as well as the influential ethics of the

*Students should take either PHL 1200 and PHL 1203 or PHL 1200 and PHL 1215. Credit will not be given for all three courses.

Bhagavad Gita. Among the philosophical issues that arise in our examination of Hinduism is the question of whether the method of yoga and meditation is a reasonable method for learning about the fundamental nature of reality.

While studying the classical texts of these systems, we will critically explore the techniques employed within these traditions: the method of yoga, the function of the guru, various methods of meditation, the point of non-violence, the function of philosophical analysis, and the role of the austerities. In so doing, we study Hinduism as it is currently practiced in India; Theravada Buddhism as it is currently practiced in Sri Lanka and Thailand; the Tibetan tradition of Mahayana Buddhism; and the nonviolence of Ghandi.

To study Indian philosophy is to study a tradition of philosophy in which ethics is not fragmented from epistemology, knowledge is more than justified true belief, and one's metaphysics is to be realized. In our study, besides the classical texts, we will employ films and guest speakers.

PHL 1265 American Religions

4 Q.H.

This course will approach the American religious tradition from three perspectives. First, we shall examine the transplanted and transformed European traditions in the context of American diversity and pluralism. The Protestant, Roman Catholic, and Jewish traditions will be the most significant examples. Second, we shall look into the rise and establishment of largely indigenous religious groups who have forged their own foundations in the midst of the older traditions. Among others, the Mormons, the Hutterites, the Mennonites, the perfectionist groups (such as the older Oneida Community and the Shakers, and the more recent "cults"), and the black and Native American groups are especially significant because of their attempts to survive apart from the general culture. Third, we shall explore the theory of an American civil religion—the notion that there is a general religious meaning for American culture that makes the coexistence of the many religious groups possible and gives to that culture and its history a religious significance. The purpose of the course will be to achieve an understanding of what is unique and viable in the American religious tradition. (III)

PHL 1270 Western Religions

4 Q.H.

Western religion is grounded in the experience of God's presence, which transcends and transfigures the life of the individual and the community. This encounter is the essence of Judaism, Christianity, and Islam. Drawing on autobiography and biography, this course delves into the personal religious quests of such major religious thinkers as St. Augustine, St. Theresa, Martin Luther, Elie Wiesel, Richard Rubenstein, Dietrich Bonhoeffer, and Mohammed.

PHL 1275 Eastern Religions

4 Q.H.

Eastern religions appear to be fundamentally different from the orthodox religions of the West. Not only

do Hinduism, Buddhism, and Taoism promise a solution to the problem of suffering (compare the common Christian and Jewish attitudes), but most of these religions do not have a central God personality, and some explicitly reject such a concept as meaningless, or at least as irrelevant to leading a religious life. Central to these views is a way of being in the world which emphasizes meditation, skillful and compassionate action, and a direct awareness of the fundamental nature of reality. The course first tries to make sense of the difficult notion that the way we perceive reality may be illusory. It then examines Theravada Buddhism, a religion that rests on the insights that everything is impermanent and that it is possible to live fully in the present without any suffering. From Theravada Buddhism, the course turns to Mahayana Buddhism, and then to Taoism, a subtle view that emphasizes the "flow" of life and that "the way to do is to be." Next, the Hinduism of the Upanishads is examined. As part of the exploration of this form of Hinduism, students are given the opportunity to examine intellectually and also to practice a few methods of meditation. In addition, the course investigates the devotional aspect of Hinduism as expressed in the Bhagavad Gita. There will also be an exploration of Zen. (IV)

PHL 1280 Islam

4 Q.H.

The course explores the history of Islam, its conflicts with the West in past and present, Islamic beliefs, the future of Islam as a world religion, and relations of Islam with Christianity and Judaism. Since Islamic faith touches upon social, political, and legal issues, the course is concerned with them as well as with the more familiar religious and theological questions. (IV)

PHL 1290 Cults and Sects

4 Q.H.

This course offers an examination of the varieties of religious experience from the perspectives of sociology and psychology of religion. This course focuses on such cultic and sectarian groups as Christian Science, the American Shakers, the Unification Church, the Hare Krishna movement, and the Black Muslims. The primary purpose of this course is to provide the student the opportunity to acquire critical investigative tools with which to analyze different religious expressions. (III)

PHL 1293 Mysticism: East and West

4 Q.H.

(Prereq. PHL 1115 or permission of instructor)

The course offers an inquiry into mystical experience through a comparative study of the writings of Christian, Buddhist, and Hindu mystics and of secondary interpretive sources. Areas taken up are the potential oneness of man and God, the conflict of mystics with traditional forms of religion, and the possibility of a common, cross-cultural basis for mysticism.

PHL 1295 Medicine, Religion, and the Healers' Art

4 Q.H.

This course explores aspects of the historical, religious, and cultural context for contemporary alternatives in health care, beginning with an examination of

several examples of traditional healing practices and their accompanying religious and philosophical views about human life. Course material explores this "holistic" tradition in two frames of reference: the ascendancy of scientific rationalism over religion, and the takeover, by male-dominated professions, of healing functions that society has traditionally assigned to women (e.g., the rise of obstetrics and the suppression of midwifery). Special attention is given to major women healers of the nineteenth century. Course includes a look at some contemporary efforts at reintegration of scientific and traditional values in the modern health care system. Students will also meet and interact with patients and healers active in the modern holistic health movement.

PHL 1300 Religion in a Social Context 4 Q.H.

This course offers an exploration of the social forms of religion. The structures and roles of the church, synagogue, and sect are described and critically evaluated. In addition, emphasis is given to their functions, with reference to general social structure, process, and reform.

PHL 1305 Religion in the Age of Science 4 Q.H.

This course examines the problems posed by the interaction between religion and the natural and social sciences. Representative selections from Hume, Darwin, Marx, Freud, Erickson, and Troeltsch are used to interact with selections from Bultmann, Teilhard de Chardin, Niebuhr, Bonhoeffer, and Tillich.

PHL 1310 The Occult as Religion 4 Q.H.

The course focuses on the history, aims, and methods of such esoteric or mystic doctrines as astrology, numerology, magic, demonism, and divination, and investigates the structural similarities of these religious forms to those of the dominant religious traditions of the world.

PHL 1315 Understanding the Bible 4 Q.H.

This course introduces students to the Old and New Testaments, so that they may enter into a dialogue with the Bible, understanding not only what it says, but why it is said that way. To do this, discussion focuses on the Bible's social, political, and cultural backgrounds. (III)

PHL 1320 The Meaning of Death 4 Q.H.

This course offers an inquiry into different philosophical and religious perspectives on death and life after death, including an examination of some powerful contemporary accounts of personal confrontation with death, along with investigations into attitudes toward death in other traditions (e.g., Hinduism and Buddhism). In addition, the course explores responses to the Holocaust in Europe, and theories about life after death (such as those discussed in Raymond Moody's *Life After Life* and Ian Stevenson's *Reincarnation*). (V)

PHL 1325 Philosophy of Death, Grief, and Dying 4 Q.H.

This course explores fears about death and dying and the grieving process, and examines the processes

people sometimes experience while dying. In addition, the course examines current practices of caring for the dying and of coping with bereavement, questioning whether these practices are, in fact, healthy, helpful, and/or ethical. Other relevant ethical issues to be examined include euthanasia, truth-telling with the dying, suicide, and paternalism. The course will close with the question of the meaning of life, given the fact that we must die.

PHL 1335 Moral Philosophy 4 Q.H.
(Prereq. 4 Q.H. philosophy or religion or permission of instructor)

What sorts of things are good and bad? What actions are right and wrong? These two basic questions are explored. The course covers major classical conceptions of ancient Greece and Rome, their replacement by the Western religious ethic, its modification and rejection in the early modern period, and the emergence of modern versions of traditional conceptions of the good life, with reflections on the nature of ethical inquiry itself as a legitimate study.

PHL 1340 Aesthetics 4 Q.H.
(Prereq. 4 Q.H. philosophy)

This course offers a historical approach to aesthetics. Aesthetics is the philosophical analysis of concepts and the solution of problems that arise when one contemplates beautiful (or ugly) objects; it is also concerned with standards of value in judging art. Aesthetics asks the following questions: What features make objects beautiful (or ugly)? Are there aesthetic standards? What is the relation of works of art to nature? What is the nature of an aesthetic experience?

PHL 1345 Philosophy of Religion 4 Q.H.
(Prereq. 4 Q.H. philosophy)

The basic question in this course is "Does God exist?" The course examines several major arguments affirming and criticizing the notion of God's existence. A central problem in recent philosophy of religion is whether or not it makes any sense to speak of the truth (or falsity) of religious belief, as well as the implication an answer to that issue has for religious life; this topic will be examined in the latter half of the course.

PHL 1350 Philosophy of Human Nature 4 Q.H.

The course offers a philosophical inquiry into the theories of man, man's dimensions, and human nature. The question of the existence of human nature is thoroughly examined. Special interest will be given to contemporary theories of man and self-alienation, and their influence in social sciences. Selected readings from Descartes, Hobbes, Hegel, Marx, Kierkegaard, Maritain, Freud, Skinner, Fromm, and Frankl.

PHL 1355 Existentialism and Literature 4 Q.H.

After World Wars I and II, existentialist philosophy inspired the literature of "extreme situations." This course examines human extreme experiences in existentialist philosophy and novels. Some of the major themes are loneliness; self-alienation; social pressures; conformity; absurdity; anxiety; social, political,

and moral crises; nothingness; and death. Selected readings will include the most influential European and American authors.

PHL 1360 Philosophy and Literature 4 Q.H.

The purpose of this course is to provide the student the opportunity to learn to recognize, appreciate, and criticize philosophical themes in literature. The readings typically include acknowledged classics by philosophical authors such as Voltaire, Dostoevski, and Sartre, as well as such popular contemporary authors as Vonnegut, Barth, and Pynchon. There are also some readings from more straightforward philosophical sources. Philosophical topics include the meaning of life, the human condition, depersonalization, alienation, human freedom, questions of value, responsibility, rationality, and personal identity. Religious, nihilistic, existential, and other points of view are explored.

PHL 1370 The Meaning of Life 4 Q.H.

The course offers an examination of selected philosophical problems of human existence in the contemporary world, with major emphasis on the search for identity and self-fulfillment. Selected problems are discussed, such as freedom, death, sexuality, alienation, becoming a person, and peak experiences. The course includes readings from Kierkegaard, Heidegger, Sartre, Camus, Maslow, Allport, Frankl, Rogers, and Rollo May.

PHL 1375 Freud, Skinner, and Their Critics

4 Q.H.

(Prereq. 4 Q.H. philosophy or permission of instructor)
The course provides an examination of fundamental themes and concepts of Freud's psychoanalysis and Skinner's psychology from a philosophical perspective and criticisms of them from the point of view of reformed Freudians and existentialists. Selections include Freud, Jung, Adler, Karen Horney, Skinner, Koestler, Pearls, Sartre, Merleau-Ponty, and Kovaly.

PHL 1400 Theory of Knowledge 4 Q.H.

(Prereq. 4 Q.H. philosophy or permission of instructor)
This is an introduction to epistemology, or theory of knowledge, which asks the following questions: What is knowledge? Is knowledge (or even certainty) attainable? What are the limitations of human knowledge? How is knowledge—if we have it—acquired? What roles do reason and experience play in the attempt to attain knowledge? This course uses both classical (René Descartes and David Hume) and contemporary sources (Bertrand Russell and others). Various theories of knowledge, such as empiricism, rationalism, and scepticism, are examined and criticized. The student is encouraged to form at least tentative opinions on these issues.

PHL 1405 Metaphysics 4 Q.H.

(Prereq. 8 Q.H. philosophy)

The course offers a consideration of central problems and theories concerning the nature of reality, with special attention to such areas as the relation between mind and matter, free will and determinism, and criteria of existence.

PHL 1410 Philosophy of Science 4 Q.H.

(Prereq. 4 Q.H. philosophy)

Science is the dominant intellectual force of our culture. This course focuses on the nature of scientific method, scientific theories, and scientific explanations. A central question is: Why is science thought to provide the most reliable account of the nature of reality? Various theories about the nature and reliability of science are considered.

PHL 1415 Advanced Logic 4 Q.H.

(Prereq. PHL 1215)

The course offers a study of the major results in the meta-theory of first-order logic. Consistency, completeness, and decidability. Discussion of the general notion of an effectively computable process, Church's thesis, and the existence of unsolvable problems.

PHL 1430 Philosophy of Psychology 4 Q.H.

(Prereq. 4 Q.H. philosophy or 4 Q.H. psychology or permission of instructor)

The course offers an examination of the philosophical and scientific foundations of behavioristic psychology, with emphasis on the acquisition and use of language. Discussion of alternative conceptions, e.g., Chomsky's and those arising from computer studies.

PHL 1435 Philosophy of Mind 4 Q.H.

(Prereq. 4 Q.H. philosophy)

What is the relation between mind and body? Is the mental merely a function of bodily process and behavior or does it somehow exist "over and above" the material? How are self-knowledge and knowledge of other minds achieved? What is the relation between words and thoughts? This course in part, seeks to show what puzzles and problems result from an honest attempt to answer these questions in a reasonable way. Classical sources, such as Descartes and Locke, and contemporary sources, such as Wittgenstein and Putnam, are examined. But the course also seeks to arrive at some answers—however tentative or provisional—to these questions. The student is constantly challenged to think and write well about these difficult subjects.

PHL 1440 Philosophy of Language 4 Q.H.

(Prereq. Permission of instructor)

The course examines prospects for a theory of language, its syntax and semantics. Contrasts between theory of reference and theory of meaning. Are there universals of language? Relations between linguistics and psychology. Readings from Frege, Quine, Russell, Chomsky, and Fodor.

PHL 1550, PHL 1551, PHL 1552

Honors I, II, and III

(each) 4 Q.H.

Students interested in taking Junior-Senior Honors courses should confer with department chairperson. Arrangements are made between the student and a member of the faculty. Staffing by arrangement.

PHL 1565 Seminar in Wittgenstein 4 Q.H.

(Prereq. 8 Q.H. philosophy or permission of instructor)

Ludwig Wittgenstein is one of the most influential, if not the most influential, philosophers of the twentieth

century. A mysterious yet charismatic figure, he possessed both analytic genius and the creativity of a visionary. With unparalleled intensity, he addressed himself to philosophical problems. What is the relationship between language and the world? Are there thoughts "too deep" for words? What, if anything, can be said about the mystical, the beautiful, and the religious? What is consciousness and what is its role in action? What are the big, simple, mistaken ideas that cripple the philosophical enterprise? How should philosophers proceed? What is meaningful? Wittgenstein's thought is so unique that it cannot be said that any other course, or courses, in Philosophy will prepare the student for it. On the other hand, intelligent students with little formal preparation can profit from a study of Wittgenstein, given the proper dedication to truth.

PHL 1800 Directed Studies **4 Q.H.**
(Prereq. By arrangement between student and faculty)
Those interested in the Directed Studies program should meet with department chairperson. Staffing: by arrangement.

PHL 3265 Issues in Medical Ethics **4 Q.H.**
(Prereq. permission of instructor)
This course focuses on issues in medical ethics, especially as they are likely to arise in a clinical setting. Course begins with exploration of the two basic systems of ethical theory and then concentrates on their application in cases exemplifying the issues of euthanasia, paternalism, experimentation, informed consent, quality of life, professional responsibility, right to health care, truth telling, genetic control, abortion, and the allocation of scarce medical resources.

INT 1400 Professional Practices: Individual and Social Dimensions **4 Q.H.**
The course explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within the limits set by socioeconomic conditions, clients, and other professionals. Case histories are examined to illustrate the dilemmas professionals face, the choices that are typically made, and the consequences these have on the freedom of the practitioner and on personal and professional integrity.

Physics

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

Courses are listed according to level and degree of specialization and are not in numerical order. General interest courses have no prerequisites and may be used to satisfy College of Arts and Sciences distribution requirements in science. Introductory physics courses are basic first-year physics lecture courses; the corresponding laboratories are listed under introductory physics laboratories. Advanced physics and astronomy courses require one year of introductory physics and may be used to satisfy degree requirements for physics majors.

General Interest Courses

PHY 1101 Physics in Music **4 Q.H.**
This course discusses the physical principles involved in producing, recording, and reproducing music. Topics include explanations of the operation of various instruments in terms of the basic properties of resonances and waves; physical and psychological response of the ear; the physical basis of the modern (well-tempered) system of tuning; the operation of microphones, amplifiers, loudspeakers, tape recorders, radios, and other devices.

PHY 1111 Introduction to Astronomy I **4 Q.H.**
The first quarter of a two-quarter sequence, this course offers the nonscience student an introduction to modern astronomical ideas. Topics include introduction to the cosmos; tools of the astronomer (atoms, the nature of light and radiation, telescopes, space astronomy); the earth in space; our solar system

(origin and future of the solar system, the planets and other bodies, the latest from spacecraft flights, the sun as our bridge to the stars); the question of life in the universe. (II)

PHY 1112 Introduction to Astronomy II **4 Q.H.**
(Prereq. PHY 1111)
Topics include properties of stars: life and death of stars (Hertzsprung-Russell diagram, birth of stars, main sequence, red giants, white dwarfs, supernovae, neutron stars, black holes); our Milky Way galaxy; galaxies; quasars, cosmology (the expanding universe, the big bang, the future of the universe).

PHY 1121 Introduction to Science I **4 Q.H.**
PHY 1121 and PHY 1122 form a two-quarter sequence for nonscience majors that provides an interdisciplinary treatment of the basic ideas of the natural sciences. Concepts such as energy, gravity, and the

atom are discussed, followed by a consideration of the ways in which atoms combine to form the substances that comprise matter. (II)

PHY 1122 Introduction to Science II 4 Q.H.
(Prereq. PHY 1121)

This course applies principles previously learned in PHY 1121 to selected topics in biology, chemistry, physics, and geology. The subjects actually covered depend on the interests of the instructor, and, to some extent, on those of the students.

Introductory Physics Courses

PHY 1191 Physics I 4 Q.H.
(Prereq. MTH 1191, may be taken concurrently; B.E.T. majors only)

Topics include units and scientific notation, force, Newton's first law, static equilibrium, Newton's second law, momentum, work, kinetic energy, potential energy.

PHY 1192 Physics II 4 Q.H.
(Prereq. PHY 1191; MTH 1192 may be taken concurrently; B.E.T. majors only)

Topics include power, rotational motion, Pascal's law, hydrostatic pressure, molecular mass, ideal gas law, first and second laws of thermodynamics, simple harmonic motion, wave motion, sound, light.

PHY 1193 Physics III 4 Q.H.
(Prereq. PHY 1192; B.E.T. majors only)

Topics include electrostatics, circuit elements, direct current circuits, magnetism, electromagnetic induction, electromagnetic waves, atomic and nuclear physics.

PHY 1201 Physics for the Life Sciences I 4 Q.H.
Topics include vector addition of force, principles of statics; Newton's second law, kinetic and potential energy; pressure static properties of fluids, fluid flow. To take the laboratory for this course, register for PHY 1501 concurrently. (II)

PHY 1202 Physics for the Life Sciences II 4 Q.H.
(Prereq. PHY 1201)

Topics include wave motion, sound, light, optics, static electricity, d.c. circuits, magnetism. To take the laboratory for this course, register for PHY 1502 concurrently. (II)

PHY 1203 Physics for the Life Sciences III 4 Q.H.
(Prereq. PHY 1201)

Topics include temperature, gas laws, properties of liquids (surface tension and osmotic pressure), properties of solids, thermal physics, Coulomb's law, atomic and nuclear physics.

PHY 1209 Basic Physics I 4 Q.H.
(For Respiratory Therapy students only.)

Topics include the physical properties of gases and condensed matter, force and pressure, hydrostatics, ideal and real gases, condensation and evaporation, surface tension, osmosis and fluid flow. Laboratory is an integral part of the course.

PHY 1221 Physics for Engineering Students I

4 Q.H.

(Prereq. MTH 1123 or equiv., may be taken concurrently)

The first quarter of a four-quarter sequence intended primarily for engineering students, this course covers mechanics, kinematics, dynamics, Newton's laws, work, energy, linear momentum, collisions.

PHY 1222 Physics for Engineering Students II

4 Q.H.

(Prereq. PHY 1221; MTH 1124 or equiv. may be taken concurrently)

A continuation of PHY 1221, this course focuses on rotational dynamics, angular momentum, statics, harmonic motion, wave motion, sound, and optics.

PHY 1223 Physics for Engineering Students III

4 Q.H.

(Prereq. PHY 1222; MTH 1125 or equiv. may be taken concurrently)

A continuation of PHY 1222, the focus of this course is on electricity, electrostatics, Gauss's law, electric fields, potential, capacitance, resistance, current Ohm's law, circuits, the magnetic field.

PHY 1224 Physics for Engineering Students IV

4 Q.H.

(Prereq. PHY 1223; MTH 1126 or equiv. may be taken concurrently)

A continuation of PHY 1223, this course covers induction, inductance, and energy in the magnetic field; electromagnetic waves; exponential processes; and elementary thermodynamics.

PHY 1231 Physics for Science Majors I

4 Q.H.

(Prereq. MTH 1143 or equiv. may be taken concurrently)

Topics include mechanics: kinematics, Newton's laws, circular motion, work energy, linear momentum. To take the laboratory for this course, register for PHY 1531 concurrently. (II)

PHY 1232 Physics for Science Majors II

4 Q.H.

(Prereq. PHY 1231; MTH 1144 or equiv. may be taken concurrently)

Topics include rotational motion, angular momentum, harmonic motion, wave motion, sound, heat and thermodynamics, kinetic theory. To take the laboratory for this course, register for PHY 1532 concurrently. (II)

PHY 1233 Physics for Science Majors III

4 Q.H.

(Prereq. PHY 1231; MTH 1145 or equiv. may be taken concurrently)

Topics include electricity and magnetism; circuits; electromagnetic waves; topics in modern physics. To take the laboratory for this course, register for PHY 1533 concurrently.

PHY 1241 Physics for Computer Science Majors I

4 Q.H.

(Prereq. Two quarters calculus)

The first quarter of a three-quarter sequence. Topics include kinematics, dynamics, Newton's laws, gravity, work, energy, momentum, and collisions.

PHY 1242 Physics for Computer Science Majors II
4 Q.H.

(Prereq. PHY 1241 and three quarters calculus)
The second quarter of a three-quarter sequence. Topics include circular and rotational motion, oscillations, waves, atomic physics, astronomy and cosmology, and relativity and its application to nuclear physics.

PHY 1243 Physics for Computer Science Majors III
4 Q.H.

(Prereq. PHY 1242)
The third quarter of a three-quarter sequence. Topics include electricity and magnetism, semiconductors and semiconductor devices.

PHY 1251 Physics Review for Engineering Students
6 Q.H.

(Prereq. One year of college physics; knowledge of elementary calculus)

This course offers an intensive review for students who have had previous college physics courses not equivalent to the engineering sequence PHY 1221-PHY 1224. Topics include fundamentals of mechanics, electricity, and magnetism with emphasis on the use of vectors and elementary calculus. Passing this course is equivalent to passing PHY 1223 and PHY 1224.

Introductory Physics Laboratories

PHY 1194 Physics Laboratory I* 2 Q.H.

(Prereq. PHY 1191; PHY 1192 concurrently; B.E.T. majors only)

This course covers experiments from various physics topics that have been covered in PHY 1191 and, concurrently, in PHY 1192.

PHY 1195 Physics Laboratory II* 2 Q.H.

(Prereq. PHY 1194, PHY 1192; PHY 1193 concurrently; B.E.T. majors only)

This course is a continuation of PHY 1194, with experiments from topics in PHY 1192 and PHY 1193.

PHY 1501 Physics Laboratory for the Life Sciences I
1 Q.H.

(Prereq. PHY 1201 concurrently)

This course is the first quarter of a two-quarter laboratory sequence accompanying PHY 1201 and PHY 1202.

PHY 1502 Physics Laboratory for the Life Sciences II
1 Q.H.

(Prereq. PHY 1501; PHY 1202 or PHY 1203 concurrently)

This course is a continuation of PHY 1501.

PHY 1521 Physics Laboratory for Engineering Students I 1 Q.H.

(Prereq. PHY 1223)

This course is the first of a two-quarter laboratory sequence in which the student performs experiments from various fields of physics.

PHY 1522 Physics Laboratory for Engineering Students II 1 Q.H.

(Prereq. PHY 1521 and PHY 1224)

This course is a continuation of PHY 1521.

PHY 1531 Physics Laboratory for Science Majors I
(Prereq. PHY 1231 concurrently) 1 Q.H.

Focus is on laboratory experiments related to topics covered in PHY 1231.

PHY 1532 Physics Laboratory for Science Majors II
(Prereq. PHY 1531; PHY 1232 concurrently) 1 Q.H.

Focus is on laboratory experiments related to topics covered in PHY 1232.

PHY 1533 Physics Laboratory for Science Majors III
(Prereq. PHY 1531; PHY 1233 concurrently) 1 Q.H.

Focus is on laboratory experiments related to topics covered in PHY 1233.

Advanced Physics and Astronomy Courses

PHY 1301 Intermediate Mechanics 4 Q.H.

(Prereq. PHY 1232 and PHY 1233; MTH 1243 concurrently)

Topics include classical mechanics in two and three dimensions; a review of Newton's laws; special emphasis on conservation theorems for energy, momentum and angular momentum; harmonic and wave motion.

PHY 1302 Electric and Magnetic Fields 4 Q.H.

(Prereq. PHY 1301; MTH 1244 concurrently)

This course focuses on the basic concepts of electric and magnetic fields, including electric and magnetic fields in free space and materials; Maxwell's equations in integral form.

PHY 1303 Modern Physics 4 Q.H.

(Prereq. PHY 1233, PHY 1224, or equiv.)

The course provides a review of experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and the properties of elementary particles. The course discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state, and elementary particles.

PHY 1304 Mathematical Physics 4 Q.H.

(Prereq. PHY 1233 and MTH 1244; MTH 1246 concurrently)

Topics include review of linear algebra and vector calculus; special functions and partial differential equations of physics; potential theory; functions of a complex variable.

PHY 1305 Thermodynamics and Kinetic Theory
(Prereq. PHY 1233 or PHY 1224; MTH 1244) 4 Q.H.

Topics include First and Second Laws of Thermodynamics; entropy and equilibrium; thermodynamic potentials; elementary kinetic theory; statistical mechanics and the statistical interpretation of entropy.

PHY 1311 Physics Review for Re-entry Students(Prereq. Two years of physics) **4 Q.H.**

This is a review course on the material covered by PHY 1401, PHY 1305, and PHY 1404. Topics include vector kinematics; generalized coordinates; Lagrange equations; harmonic and coupled oscillators, wave equation; physical optics, interference, diffraction, optics of solids, lasers; entropy and equilibrium, thermodynamic potentials; elementary kinetic theory; statistical mechanics.

PHY 1401 Classical Mechanics**4 Q.H.**

(Prereq. PHY 1301 and MTH 1245)

This course covers advanced topics in classical mechanics, including vector kinematics; harmonic oscillator and resonance; generalized coordinates; Lagrange's equations; central forces and the Kepler problem; rigid body motion.

PHY 1402 Electricity and Magnetism I**4 Q.H.**

(Prereq. PHY 1302; PHY 1304 or equiv.)

The first of a two-quarter sequence in electromagnetic theory, this course covers Maxwell's equations and their experimental basis; electrostatics and magnetostatics; the electromagnetic field in empty space; electromagnetic waves.

PHY 1403 Electricity and Magnetism II**4 Q.H.**

(Prereq. PHY 1402 or equiv.)

A continuation of PHY 1402, this course focuses on energy and momentum in the electromagnetic field; electrodynamics; the interaction of matter and the field; radiation.

PHY 1404 Wave Motion and Optics**4 Q.H.**

(Prereq. PHY 1302)

Topics include harmonic and coupled oscillators, wave equation; geometrical and physical optics; interference, diffraction, optics of solids, amplification of light; lasers.

PHY 1411 Introduction to Astrophysics and Cosmology**4 Q.H.**

(Prereq. Three quarters of elementary physics)

The purpose of this course is to introduce the student to current ideas in astrophysics and cosmology, with emphasis on recent advances in this field. Topics include tools of the astronomer (gamma-, X-, UV-, optical-, infrared-, radio-telescopes, spectroscopes, spacecrafts, etc.); solar system; stellar properties (site luminosity); stellar spectra; Hertzsprung-Russell diagram; stellar energy sources (gravitational, nuclear); evolution of stars (birth, main sequence, red giants, white dwarfs, planetary nebulae, supernovae, neutron stars and pulsars, black holes and gravitational collapse); methods of interstellar and intergalactic distance measurement; our Milky Way galaxy; extragalactic objects (galaxies, clusters of galaxies, radio galaxies, quasars); cosmology (Olber's paradox; recession of galaxies, big bang theory, cosmic background radiation, formation of galaxies, the future of the universe).

PHY 1412 Plasma Physics**4 Q.H.**

(Prereq. PHY 1224 or PHY 1302 or equiv.)

The aim of this course is to introduce the student to the study of plasma physics. The course will develop the fundamentals of plasma physics in a manner that does not require an extensive background in advanced physics.

PHY 1413 Introduction to Nuclear Physics

(Prereq. PHY 1303)

4 Q.H.

Topics include nuclear structure, nuclear masses, radioactivity, nuclear radiation, interaction of radiation and matter, detectors, fission, nuclear forces; elementary particles.

PHY 1414 Introduction to Solid State Physics**4 Q.H.**

(Prereq. PHY 1303 or CHM 1383; PHY 1305 or equiv.)

This course offers a semiclassical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Topics include X-ray diffraction and the reciprocal lattice, elasticity and lattice vibrations, specific heat, properties of insulators, magnetism in insulators and metals, introduction to the band theory of metals.

PHY 1415 Quantum Mechanics I**4 Q.H.**

(Prereq. PHY 1303 or CHM 1383; PHY 1304 or equiv.)

The first of a two-quarter sequence in quantum mechanics, this course focuses on observation of macroscopic and microscopic bodies, the uncertainty principle, wave-particle duality, probability amplitudes, Schrodinger wave theory, one-dimensional problems.

PHY 1416 Quantum Mechanics II**4 Q.H.**

(Prereq. PHY 1415)

A continuation of PHY 1415, this course covers discrete and continuous states, Schrodinger equation in three dimensions, angular momentum, general theory of quantum mechanics, applications.

PHY 1551 Electronics for Scientists I**4 Q.H.**

PHY 1551 and PHY 1552 form a two-quarter sequence covering electronic techniques for experimental research in many different fields of science. Topics include principles of semiconductor devices; analog techniques (amplification, feedback, integration); digital techniques (counting, multiplexing, logic); design of electronic subsystems (analog-to-digital converters, phase-sensitive detectors, data-logging systems); understanding specifications of commercial electronic equipment. Lab examples make use of up-to-date integrated and discrete devices such as are currently used in the electronic industry.

PHY 1552 Electronics for Scientists II**4 Q.H.**

(Prereq. PHY 1551)

This course is a continuation of PHY 1551.

PHY 1555 Wave Laboratory**4 Q.H.**

(Prereq. PHY 1302 or PHY 1224)

This course offers a general treatment of the problems of mechanical and electromagnetic radiation as wave phenomena. Topics include the differential wave

equation and its application to selected topics; interference and diffraction theory from the standpoint of the Huygens-Fresnel and Kirchhoff formulations; selected experiments in acoustics, optics, and micro-waves to illustrate these problems.

PHY 1557 Advanced Physics Laboratory 4 Q.H.
(Prereq. PHY 1551 and PHY 1552)

This course presents special projects in modern experimental physics; including electronic instrumentation used in measuring physical quantities and use of microprocessors.

PHY 1561 Project Laboratory 4 Q.H.
(Prereq. Permission of instructor)

This course allows students to select and carry out individual projects involving instrumentation and computation. The projects involve the development of some aspect of instrumentation and/or computation in an ongoing research project, and the preparation of a

final report. The student will be supervised by the project leader and the course instructor. Although the course carries 4 Q.H. credit, it is taken in successive winter and spring quarters.

PHY 1811 (1812, 1813) Independent Study 1 Q.H.

PHY 1821 (1822, 1823) Independent Study 2 Q.H.

PHY 1831 (1832, 1833) Independent Study 3 Q.H.

PHY 1841 (1842, 1843) Independent Study 4 Q.H.

PHY 1885, PHY 1886, PHY 1887 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Project on page 1.

Political Science

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

POL 1110 Introduction to Politics 4 Q.H.

This course offers a broad-based introduction to contemporary political science. Areas covered include a consideration of basic concepts in political analysis (e.g., power, authority, and sovereignty); the role of governmental institutions in the making of public policy; public opinion and processes of political representation; contemporary political ideologies; and the scope and methods of political science. (II)

POL 1111 Introduction to American Government 4 Q.H.

The course provides an analysis of the American governmental and political processes by focusing on constitutionalism, liberties, institutions, and political behavior. (II)

POL 1112 Introduction to International Relations 4 Q.H.

The course focuses on elements of international relations, including sovereign power, and limitations on the behavior of nation-states. International law, diplomacy, the politics of international economic relations, and contemporary problems in international relations—peace and war, the arms race, detente, human rights, technology, population, and neoimperialism—will be covered. (II)

POL 1113 Introduction to Foreign Governments and Societies 4 Q.H.

(Formerly Introduction to Comparative Government)
The course offers a comparative study of parliamentary democracy in Western Europe; Communist totalitarianism in the Soviet Union, China, and Eastern

Europe; and variations of these governmental systems in the "third world" countries of Asia, Africa, and the Middle East.

POL 1260 Public Policy Analysis 4 Q.H.

An analysis and evaluation of public policy in the United States.

POL 1261 Public Administration 4 Q.H.
(Prereq. POL 1111)

Introduction to the theory and practice of public administration, with special emphasis on the generalities of institutions, processes, and behavior of bureaucratic organizations.

POL 1262 Organization Theory 4 Q.H.

Provides a broad overview of organization theories, their history, and development. Specific attention is given to developing a paradigm for public organizations that focuses on the relationships of economic, democratic, bureaucratic, technological, and humanistic imperatives. The student will prepare a research paper and consider the implications of this paradigm for future organizations.

POL 1266 Public Personnel Administration 4 Q.H.
(Prereq. POL 1261)

Designed to be an overall introduction to the field of public personnel administration. It includes examination of selected topics such as recruitment, selection, classification, case development, equal opportunity, public employee unionism, and collective bargaining.

POL 1267 Public Budgeting**4 Q.H.**

(Prereq. POL 1261)

Focuses on the function of budgeting in a variety of governmental contexts, specifically, the appropriations process, the budget as a management tool, and the public policy impacts of the budget. Budgeting techniques are emphasized within this context.

POL 1300 Conceptual Foundations of**Contemporary Political Analyses****4 Q.H.**

The course provides an introduction to the conceptual problems associated with the study of politics, including scientific method and a general overview of various methodological perspectives (e.g., systems theory, game theory, and survey analysis) as practiced by contemporary political scientists.

POL 1301 Research Methods I**4 Q.H.**

The course offers an introduction to the principal quantitative methods used in political analysis, public administration, political behavior, international relations, and policy sciences. Emphasis is on basic statistical techniques, survey methods, and SPSS programming.

POL 1302 Research Methods II**4 Q.H.**

(Prereq. POL 1301)

This is an intermediate course in methods of quantitative analysis. The primary statistical topics to be covered include significance testing, bivariate regression and correlation, and multiple regression and correlation. In addition, students will be taught elementary computer skills and the use of the programming language Statistical Package for the Social Sciences (SPSS) to calculate advanced statistics. This course will emphasize the practical application and understanding of statistical techniques by providing numerous examples in the areas of political behavior, public opinion, and public policy analysis.

POL 1303 Political Behavior**4 Q.H.**

(Prereq. POL 1110)

This course examines selected topics in contemporary political science from a political behavior perspective. Topics include political attitude formation and change, ideology, socialization, public opinion and voting behavior, political campaigning, political violence, and empirical democratic theory.

POL 1304 Practical Politics**4 Q.H.**

(Prereq. POL 1111)

This course is designed to accentuate and systematically treat some of the problems of organizing for effective citizen action, partisan and nonpartisan, at the grass-roots level. An exploration of roles in political campaigning.

POL 1306 Politics in Western Europe**4 Q.H.**

(Prereq. POL 1113)

The course offers a comparative analysis of political culture, federal and unitary forms of government, and executive-legislative relations on the national level in England, France, and West Germany.

POL 1307 European Political Parties**4 Q.H.**

(Prereq. POL 1113)

The focus of this course is on political party organization and voter behavior in England, France, and Germany, with emphasis on party ideologies, strategies, campaigns, and elections, as well as socialization. Recruitment, and participation of voters in the political process.

POL 1308 The Politics of Poverty**4 Q.H.**

This course is concerned with what is referred to as the poverty system: how and why there is poverty, how it affects people's lives, and how it can be eliminated. As a discussion-centered course, relying also on simulations, small-group work, and experience-based learning, it examines the relations between poverty, racism, and the economic, political, and administrative systems. A number of alternatives will be evaluated and an opportunity provided for clarifying individual assumptions and feelings about poverty.

POL 1309 The Politics of Imperialism**4 Q.H.**

(Prereq. POL 1112)

The course focuses on the political dynamics of penetration of foreign economies and foreign politics, considering such elements as military intervention, foreign aid, and the impact of the multinational corporations.

POL 1310 American Ideology**4 Q.H.**

An analysis of the main American ideologies, including liberalism, neoliberalism, conservatism, neoconservatism, nationalism, etc. Examination of the historic roots of each ideology and its impact on American politics. An attempt to understand the ongoing interaction of political ideology and the political process in contemporary American society. (V)

POL 1312 Politics and the Mass Media**4 Q.H.**

This course analyzes several facets of the mass media; the role of newspapers, radio, and television in public opinion formation; their use and effectiveness in political campaigns; their objectivity and/or bias in reporting the news; their impact on political parties and the distribution of power between Congress and the President.

POL 1313 International Organization**4 Q.H.**

(Prereq. POL 1112)

The course focuses on development of international organizations with special emphasis on the United Nations system. (Public Administration elective)

POL 1315 The Politics of the Criminal Justice System**4 Q.H.**

(Prereq. POL 1111 or POL 1377)

This course focuses on the criminal justice system from arrest by police to appeal to the Supreme Court of the United States. The roles of police, lawyers, judges, prosecutors, juries, and correction officers are examined.

POL 1316 Contemporary Revolutionary Politics

(Prereq. POL 1112 or POL 1113)

4 Q.H.

Examination of political development in selected revolutionary societies, including Cuba. (VI)

POL 1317 Law and Society 4 Q.H.

(Prereq. Open only to upperclass, nonpolitical-science majors.)

This course examines the theory and practice of the American legal process and its impact on values. Also an analysis of the impact on these values of the military-industrial-technological complex.

POL 1318 State and Local Government 4 Q.H.

(Prereq. POL 1111)

This course introduces students to the political and administrative context of state and local government and surveys the structure, function, and politics of states and localities within the context of the United States federal system. (Public Administration elective)

POL 1320 Political Parties, Pressure Groups, and Elections 4 Q.H.

An analysis of political parties and pressure groups in the American political system, with attention given to policy making, elections, voting behavior, and state and national political trends.

POL 1321 Eurocommunism 4 Q.H.

This course presents a study of the domestic and foreign policies of the Spanish, French, and Italian Communist parties with special attention to their relations with the international communist movement.

POL 1322 World Politics 4 Q.H.

The course examines political continuum and change in the international system by observing both traditional actors, such as nation-state, and modern actors, such as multinational corporations, in relation to their goals and the means each uses to attain them. Primarily for non-political-science majors; not open to anyone who has taken POL 1112, Introduction to International Relations.

POL 1324 Urban Politics 4 Q.H.

The course provides an analysis of the political, administrative, economic, and social dynamics of urban areas from a historical perspective. (Public Administration elective)

POL 1325 Human Services Administration 4 Q.H.

The ways in which human services are provided by the political, economic, and bureaucratic systems to low-income citizens are studied. The course is designed to help students develop knowledge of the public policy process, human services organizations, and delivery systems, and awareness of their values and potential as human services professionals. A discussion-based course for students interested in human services. (Public Administration elective)

POL 1327 Sex Roles in American Politics 4 Q.H.

The course explores the relation between what is and what ought to be—and why—in the roles of women in American politics. Topics include the traditional roles of women in politics, the suffrage movement, the woman as citizen and voter, the role of sex in achieving power and in political efficacy, and the place of

women in “new politics.” Political action to promote women’s issues and modern feminism will also be covered. (VI)

POL 1328 Women in Public Management 4 Q.H.

Examination of the challenges and problems commonly experienced by female managers working in complex, public sector organizations. Emphasis will be placed on strategies for elevating such problems. Special attention will be focused on career development for women in managerial roles.

POL 1329 American Social Welfare Policy 4 Q.H.

This course is an introduction to social welfare policy, with emphasis on programs and services in the contemporary United States. Theoretical frameworks for analyzing social welfare policy will be discussed; attention will then focus on the substantive areas of welfare, mental health, and social security. Various issues and processes related to the design, administration, and implementation of social welfare policy in the context of the American socio-political system will be explored. A final segment of the course will focus on social welfare policy-making under the Reagan administration.

POL 1330 Minority Politics 4 Q.H.

This course examines the voting behavior of minority populations in the United States and political developments and trends that impact on the nation’s minority communities.

POL 1331 Science, Technology, and Public Policy 4 Q.H.

The purpose of this course is to consider the effects of science and technology on politics and policy-making in America and how politics influences science and technology. We will focus on the differences between scientific and democratic values and definitions of rationality, the nature of public problems, and why some problems are easier to “solve” than others. The course will look particularly at such issues as nuclear power, recombinant DNA, abortion, and medical research, and will address the question of who should decide such complex matters.

POL 1332 Government and Politics of Japan 4 Q.H.

(Prereq. POL 1112 or POL 1113) Examines Japan’s political development from the Meiji Restoration to the present, exploring the unique form of democratic government practiced in Japan and evaluating the effects of Japanese political theory, war, the American occupation, the Emperor, and Japanese political and cultural values on Japan’s political institutions. Japan’s present and future impact on the international system is also considered. (IV)

POL 1333 Introduction to Urban and Regional Planning 4 Q.H.

The historical influences on American urban and regional planning and the contemporary institutional, theoretical, and technical issues in planning.

POL 1335 The American Presidency 4 Q.H.

This course examines the presidential electoral process and the constitutional and extraconstitutional powers of the American President. It studies presidential leadership styles and analyzes the relationship between the executive branch and Congress, the Court, the bureaucracy, and the media.

POL 1336 American Constitutional Law 4 Q.H.
(Prereq. POL 1111 and junior or senior status)

Employing excerpts of United States Supreme Court decisions and other reading materials, this course attempts an analysis of some of the theoretical, structural, and substantive issues inherent in and relevant to the American constitutional system.

POL 1337 United States Foreign Policy 4 Q.H.

The course examines formulation and conduct of foreign policy; role of the United States in politics since 1945.

POL 1339 Current Political Issues 4 Q.H.

The course provides an analysis of the constitutional and political background of selected contemporary public issues. Primarily for non-political-science majors.

POL 1340 Communism in Eastern Europe 4 Q.H.
(Prereq. POL 1113)

The course focuses on the Communist governments of Eastern Europe, with emphasis on their growing independence from Soviet Russia. Recent political change, economic liberalization, and new orientation in foreign policy.

POL 1342 Crisis and Conflict in Black Africa 4 Q.H.

Using films, maps, news clips, discussions, and readings, this course will explore contemporary politics in African nations south of the Sahara. Among the countries studied are South Africa, Nigeria, Kenya, and Ethiopia. Topics include apartheid, colonialism, Afro-Marxism, chieftancy, development, and Pan-Africanism.

POL 1343 Politics and Violence in Northern Ireland 4 Q.H.

This course will analyze the causes of violence in Northern Ireland. Although historical, sociological, and economic roots of the conflict will be considered, the major focus will be on politics. The international dimension (the roles of southern Ireland, the United States, etc.), paramilitary organizations, legal political parties and groups, and potential solutions will be discussed. Comparative parallels will be drawn, including possible lessons for the United States.

POL 1345 Government and Politics in the Middle East 4 Q.H.

Approaches the political, economic, military, and ideological factors within the Arab states and Israel, inter-Arab politics, the Arab-Israeli conflict, and the great power rivalry in the region. (VI)

POL 1347 Soviet Government 4 Q.H.
(Prereq. POL 1113)

The course offers a study of Soviet political origins and behavior, with emphasis on recent changes in

the party and state apparatus, the economy, and the administration of justice.

POL 1348 Soviet Foreign Policy 4 Q.H.

The course focuses on the evolution of Soviet foreign policy since 1917, with emphasis on the development of the international communist movement and the onset of the East-West ideological conflict.

POL 1350 American Legislative Process 4 Q.H.

This course explores the nature, style, and process of the American Congress. It focuses on congressional actors, their needs, relations with constituents, and policy-making roles, as well as the structures and processes embedded into the institution itself. Finally, the course examines the role Congress plays in American politics and how the institution fares in the 1980s.

POL 1351 Techniques and Practices of Public Management 4 Q.H.

This course is oriented toward practical skills and techniques of public management and employs the case method in examining typical management problems at different levels of government. Time and resource management for public sector managerial personnel is also covered.

POL 1353 Law and Personal Morality 4 Q.H.

An examination of the use of political power to enforce standards of personal morality and behavior in contemporary American society. Subjects considered will include pornography, sexual privacy and expression, Sunday closing laws, abortion, and prostitution.

POL 1354 The Politics and Policies of Developing Nations 4 Q.H.

The course presents a survey of recent political and related change among third-world countries of Africa, Latin America, and Asia. Topics included are the heritage of colonialism and achievement of independence, the realities of cultural pluralism, revolution and political violence, institution building, political leadership and role of ideology, political parties, the military in politics, and the international aspects of political modernization. (VI)

POL 1355 Ethnic Conflict in International Perspective 4 Q.H.

The course offers a comparative study of ethnic conflict, with its religious, linguistic, racial, and economic roots, in such places as Nigeria, Cyprus, Canada, Northern Ireland, Belgium, and the United States. World order implications and Great Power consequences of such confrontations will also be studied.

POL 1357 Totalitarianism and Dictatorship 4 Q.H.
(Prereq. POL 1113)

The course presents an analysis of totalitarianism, dictatorship, and autocracy, including study of historical background, characteristics, theories of origin, nature, and significance; evaluation of techniques, ideologies (e.g., Marxism-Leninism), policies, and institutions. Particular attention is given to Soviet and German experiences.

POL 1359 Comparative Public Administration**4 Q.H.**

The course provides a comparative study of the approaches to public administration in selected democratic governments in the United States and Europe.

POL 1360 The Politics of Revolution and Change**4 Q.H.**

(Prereq. POL 1113)

The course offers an analysis of revolution and change, contemporary and historical, with attention to both theory and practice. Topics discussed include major trends in contemporary politics and society, and the relationship between political change and technological, scientific, or social change.

POL 1362 Civil Liberties**4 Q.H.**

(Prereq. POL 1350 and junior or senior status)

Employing United States Supreme Court decisions and other reading material, this course examines the substantive and procedural guarantees of the Bill of Rights and the Fourteenth Amendment and their relation to a liberal democratic society.

POL 1363 Public Management**4 Q.H.**

(Prereq. POL 1261)

What problems are entailed in the management of public agencies? How do public managers seek to solve these problems? These questions are explored through the use of descriptive, analytical, and case materials. (Public Administration elective)

POL 1364 Business and Government Relations**4 Q.H.**

(Prereq. POL 1111 or POL 1377)

The course offers a survey of the relation between economic developments and political processes in the United States. Among the topics considered are government planning of the economy, monopoly and government regulation, government programs to promote social welfare, and the impact of Federalism on the political-economic system.

POL 1365 British Politics and Government I**4 Q.H.**

A study of British political culture, in particular traditional political values, attitudes, and expectations; the historical, economic, societal, and cultural determinants of them; and their impact on the working of the British political system today. Special attention is given to recent changes in British thought and society, i.e., in the period from World War II to the present, and how they too have affected contemporary British political behavior.

POL 1366 British Politics and Government II**4 Q.H.**

A study of British political participation that includes voting, interest groups, and political parties; and governmental institutions such as the monarchy, the Cabinet, Parliament, and the civil service. Special attention is given to leadership decision-making, in particular ministerial accountability, and to current public policy in the areas of the economy, social security and welfare, and Ireland.

POL 1368 Government and Politics of Latin America**4 Q.H.**

The governmental systems, political parties, socio-economic problems and foreign policies of Latin American states. Focus will be on political change. (IV)

POL 1369 Political Violence**4 Q.H.**

This course analyzes political violence in its various contemporary forms (e.g., revolution, genocide, political terrorism, military overthrows, etc.). The causes and consequences of political violence are assessed (from both practical and moral points of view), and strategies for preventing and resolving political violence are considered.

POL 1370 Political Theory**4 Q.H.**

(Prereq. Junior or senior status or consent)

An analytic approach to the study of key political concepts: power, equality, freedom, authority, obligation, ethics, law, rights, punishment, state, sovereignty.

POL 1371 Government and Politics of China**4 Q.H.**

Topics include government and party organization, socioeconomic problems and policies, concentrating attention on the influence of history, technology, and ideology as determinants of attitudes and behavior. (IV)

POL 1372 China's Foreign Relations**4 Q.H.**

The course examines China's traditional view of international relations and its modification first by contact with the West and later by Marxism-Leninism. The course investigates China's role in changing the international system to accord more with its perspectives on sovereignty and equality and the principles of socialist internationalism.

POL 1373 Pre-Modern Political Thought**4 Q.H.**

(Prereq. Junior status or permission of instructor)

An analytical and historical examination of the great political thinkers and the main trends of political thought from the Grecian age to the Renaissance. (V)

POL 1374 Modern Political Thought**4 Q.H.**

(Prereq. POL 1373)

An analytical and historical examination of the great political thinkers and the main trends in political thought from the Renaissance to the twentieth century. (V)

POL 1376 American Political Thought**4 Q.H.**

The contributions to political theory of the main social, economic, political, intellectual, and philosophic movements in America from the colonial period to the present.

POL 1377 American Political Process**4 Q.H.**

The course offers a general analysis of the American political system with emphasis on the topic of civil liberties. Not open to political science majors or anyone who has taken POL 1111, Introduction to American Government.

POL 1378 Contemporary Political Thought**4 Q.H.**

Analysis of current ideals, ideologies, and political movements, including existentialism, neo-Marxism, black power, women's liberation. The decline of ideology and behavioralism.

POL 1380 Governmental Accounting**4 Q.H.**

(Prereq. POL 1261)

Basic accounting principles and methods used by government agencies including the utilization and interpretation of financial statements, auditing, and the application of electronic data processing in government record keeping. (Public Administration elective)

POL 1382 Intergovernmental Relations**4 Q.H.**

An analysis of the relationships existing among national, state, and local levels of government in the United States and of the changing patterns of those relationships.

POL 1384 Arab-Israeli Conflict**4 Q.H.**

The Arab-Israeli confrontation has its own dynamics, and its nature has changed through the decades. This course analyzes its interaction with the internal politics of the Arab states and Israel, Pan-Arab politics, and the role of the great powers in the region.

POL 1385 Housing and Community Development**4 Q.H.**

The course offers a review of historical metropolitan growth patterns and the influence of public policy on the development of American cities. Topics such as urban renewal, suburbanization of low- and moderate-income housing and new communities are discussed. (Public Administration elective)

POL 1386 International Law**4 Q.H.**

(Prereq. POL 1112)

Topics include territory and jurisdiction of states, treaties, recognition, peaceful settlement of disputes, resort to force.

POL 1388 Political Polling and Survey Research**4 Q.H.**

(Prereq. POL 1301)

Survey research is the most common approach to program evaluation. This course involves an examination of the entire survey research process, including survey design, sampling, questionnaire design, survey administration, data processing, and data analysis. Some statistical analysis will also be involved.

POL 1410 Seminar in American Government**4 Q.H.**

(Prereq. Senior political science major and permission of instructor)

An in-depth study of selected topics in American government.

POL 1411 Seminar in International Relations**4 Q.H.**

(Prereq. Senior political science major and permission of instructor)

This course offers an in-depth study of selected topics in international relations.

POL 1412 Seminar in Comparative Politics**4 Q.H.**

(Prereq. Senior political science major and permission of instructor)

This course offers an in-depth study of selected topics in comparative politics.

POL 1413 Senior Seminar in Political Science

(Prereq. Senior political science major)

4 Q.H.

This course offers an in-depth study of selected topics in political science.

POL 1415 Seminar in Public Law and Social Issues**4 Q.H.**

(Prereq. Junior or senior status and permission of instructor)

This course examines some of the continuing and perplexing social problems through the media of legal writings and recent court cases. Issues to be discussed include abortion, euthanasia, family planning, criticism of public officials, political activism, the right of privacy, obscenity, racial and economic discrimination.

POL 1800, POL 1801, POL 1802 Directed Study**(each) 4 Q.H.**

This course offers independent work on chosen topics under the direction of members of the department and is limited to qualified juniors and seniors with approval of instructor.

POL 1803 Internship in Politics**4 Q.H.**

With department approval, students may engage in a political or governmental internship under the supervision of a faculty member. Junior or senior status normally required.

POL 1804 Practicum In Lobbying**4 Q.H.**

(Not open to Freshmen and Sophomores)

This is a fieldwork course in which students will become involved in supervised lobbying activity on the national or state levels of politics. This course may be taken only once for academic credit.

POL 1806 Political Science Honors Program**Minicourse****1 Q.H.**

This course deals with specialized topics in political theory.

POL 1807, POL 1808, POL 1809, PL 1810**Junior-Senior Honor Program****(each) 4 Q.H.**

For details contact the Honors Office, 183 Holmes.

Psychology

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

For additional information concerning psychology department programs and course scheduling information, inquire at the main office of the Psychology Department, 282 Nightingale Hall (telephone number 437-3076). Note that courses are listed by psychology department category and are not exclusively in numerical sequence.

Courses

PSY 1110 Perspectives in Psychology 4 Q.H.

A survey of the fundamental principles and issues of the major areas of contemporary scientific psychology. The study of psychology is approached as a method of inquiry as well as a body of knowledge using five different perspectives: neurobiological, psychodynamic, behavioral, cognitive, and humanistic. This course is recommended for Psychology majors. Since the content is similar to that of PSY 1111, students can only receive credit for *one* of the two courses. (II)

PSY 1111 Foundations of Psychology I 4 Q.H.

A survey of the fundamental principles and issues of the major areas of contemporary scientific psychology. The study of psychology is approached as a method of inquiry as well as a body of knowledge. Areas emphasized are biological bases of behavior, principles of learning, psychological testing, personality dynamics, psychopathology, and therapeutic approaches. Since the content of this course is similar to that of PSY 1110, students can receive credit for only *one* of the two courses.

PSY 1112 Foundations of Psychology II 4 Q.H. (Prereq. PSY 1111)

A continuation of PSY 1111 with emphasis on the areas of lifespan development, sensory and perceptual processes, cognition and memory, language, motivation and emotion, and social influences on behavior.

PSY 1211 Statistics in Behavioral Science II 4 Q.H.

The course offers an introduction to descriptive statistics (scales of measurement, frequency distribution and graphs, measures of central tendency, dispersion and correlation, standard scores, and the unit normal curve), and probability theory (permutations, combinations, and the binomial theorem).

PSY 1212 Statistics in Behavioral Science II 4 Q.H. (Prereq. PSY 1211)

The course offers a general presentation of hypothesis testing, including parametric and nonparametric tests, with emphasis on formulating hypotheses and choosing appropriate scales of measurement, tests, and confidence levels. (Continuation of PSY 1211)

PSY 1218 Psychology of Women 4 Q.H.

This course is designed to introduce the student with

little or no background in psychology to the current theories and research on the psychology of women. Psychological, biological, and social influences on gender differences, gender roles, and gender stereotypes will be critically examined in the light of scientific evidence and individual experience. Their consequences for society will be assessed. The unique perspective generated in the field of the psychology of women will be used to evaluate traditional research methods in psychology as well as the major psychological theories formulated to explain women and the differences between women and men. Emphasis will also be placed on fostering critical-thinking skills.

PSY 1231 Learning and Motivation I 4 Q.H. (Prereq. PSY 1112)

This course offers an introduction to the basic learning and motivational principles that permit humans and animals to adapt effectively to a changing environment. Emphasis is placed on research and theories of operant and Pavlovian conditioning, with discussions of discriminations and generalization, avoidance and punishment, acquired motivational states (e.g., addiction), concept formation, biological constraints on learning and behavior, animal cognition, and other related topics. Lectures also relate learning and motivational principles to our understanding and treatment of behavioral, affective, cognitive, and motivational disorders.

PSY 1241 Human Behavioral Development I 4 Q.H.

This course examines the change in behavioral processes from conception up to, but not including, adolescence. Topics include: biological bases of behavioral development, sensory and motor function, learning, socialization, speech and language, imitation, moral development, dependency, aggression, and abnormalities of development. Major theories of development and child-rearing practices are examined. Although relevant comparative research is considered, the emphasis is on human development.

PSY 1242 Human Behavioral Development II 4 Q.H. (Prereq. PSY 1241)

This course continues the examination of behavioral change from adolescence to death. Topics include: biological, intellectual, learning and memory, personality, and social processes. Different methods of study and theories of adult development are assessed.

PSY 1243 Infant Development**4 Q.H.**

(Prereq. PSY 1241 or ED 1102)

During the first two years of life, the basic physical perceptual, cognitive and emotional capacities emerge and interact in the development of such complex behaviors as visually guided movement, the formation of social attachments, and the emergence of language. This course provides an introduction to this critical period of human development, emphasizing how the infant's biological inheritance interacts with the physical and social environment in the generation of these important abilities and behaviors.

PSY 1261 Bilingualism**4 Q.H.**

Half of the world's population is bilingual, that is, uses two or more languages on a regular basis. And yet bilingualism remains a poorly understood phenomenon surrounded by a number of myths, such as: bilinguals are found in bilingual countries and are equally fluent in their languages; bilingual children suffer from cognitive impoverishment; bilingual education hinders the assimilation of minority groups. The course will review all aspects of bilingualism (in the world, in society, in the child and the adult), as well as discuss topics such as biculturalism and language change.

PSY 1262 Language and Cognition**4 Q.H.**

(Prereq. PSY 1112)

This course provides a basic introduction to human cognition (cognitive psychology) and the psychology of language (psycholinguistics). On the subject of cognition, the course emphasizes the mental processes involved in the acquisition, organization, and use of knowledge, including pattern recognition and memory. On the subject of psycholinguistics, it focuses on the nature and structure of language, various theories of human production and perception of language, and related experimental findings.

PSY 1271 Social Psychology**4 Q.H.**

(Prereq. PSY 1112 or permission of instructor)

The course provides an introductory survey of social psychology. Topics include aggression, attribution, attitude formation, change, measurement, conformity, impression formation, group processes (social facilitation, deindividuation, etc.).

PSY 1272 Personality I**4 Q.H.**

(Prereq. PSY 1112)

The course offers a systematic study of the normal personality and its development. Topics include behavioral, dynamic, and constitutional determinants, assessment of personality, research, and a survey of the major theories of personality.

PSY 1273 Personality II**4 Q.H.**

(Prereq. PSY 1272)

Continuation of PSY 1272.

PSY 1331 Learning and Motivation II**4 Q.H.**

(Prereq. PSY 1231)

Continuation of PSY 1231 with emphasis on biological constraints on learning, e.g., punishment, anxiety, aggression, addiction; and other topics of individual interest.

PSY 1332 Programmed Learning**4 Q.H.**

(Prereq. PSY 1231)

Development of programmed instruction has been one of the products of basic behavioral research. After students master relevant basic research literature, they are expected to review and evaluate existing instructional programs in light of the underlying behavioral principles. Programs are selected from those useful in the normal and special education classrooms, i.e., complex academic subject matter and individual problem areas.

PSY 1351 Neuropsychology I**4 Q.H.**

(Prereq. PSY 1112)

This is an introduction to the relation between brain function and human behavior. Topics include how nerve cells function individually and work together both in small networks and in the nervous system; the structure of the nervous system; how our sense organs provide the nervous system with information about the outside world; how the brain controls movement; and how psychological concepts such as perception and learning may relate to brain activity.

PSY 1352 Neuropsychology II**4 Q.H.**

(Prereq. PSY 1351)

A continuation of PSY 1351 in which the relation between brain function and more complex behavior is examined. Topics include the multiple kinds of sensory information and the neuronal and hormonal control systems involved in eating, drinking, sexual and reproductive behavior; how brain activity is related to emotion, sleep, wakefulness, and memory; disorders of behavior and of the brain.

PSY 1353 Comparative Psychology and Ethology**4 Q.H.**

(Prereq. PSY 1112 or permission of instructor)

This introductory-level course in animal behavior surveys a wide range of species (reptiles, birds, fish, and mammals, including humans) to find similarities and differences in the behavioral processes and physiological mechanisms by which individual organisms and species adapt to their environments. The first section of the course focuses on adaptive specializations exhibited by animals in learning about their environments during early development and as adults. The second section examines problems of social organizations at the individual level: how animals communicate with each other and transmit "cultural" skills; mechanisms underlying cohesion and dispersal (e.g., reproduction and aggression); and the adaptive advantages of being social or asocial. The final section provides students with an unusual opportunity to apply concepts and experimental methods they have learned by actually doing a short field study of animal behavior at The Boston Zoological Park.

PSY 1354 Functional Neuroanatomy**4 Q.H.**

(Prereq. PSY 1112)

Aimed primarily at the study of the human nervous system, this course focuses on study of the cellular structure of the nervous system, including a cell's

organelles, followed by a short study of the embryological development of the nervous system. Systematic study of the nervous system beginning in the spinal cord and ending in the cerebral cortex with primary emphasis on fiber connections. A continuous attempt to correlate structure with behavioral activity.

PSY 1361 Introduction to Phonetics 4 Q.H.

The course offers an introduction to the nature of the speech signal from articulatory, perceptual, and acoustic points of view. Topics include sound measurement, sound classes, and a survey and comparison of speech sounds used in languages in the world. Stress, tone, and intonation. Phonetic classification and transcription of speech as practical tools for students of languages, linguistics, and speech and hearing science.

PSY 1362 Child Language 4 Q.H.

(Prereq. PSY 1262, linguistics, or permission of instructor)

The course provides a study of the manner in which language develops in children.

PSY 1363 Linguistics of American Sign Language 4 Q.H.

(Prereq. ASL 1101 or permission of instructor)

Offers students an introduction to basic issues in linguistics through examination of the structural properties of American Sign Language and its comparison with other languages having similar properties. Topics to be covered include phonology (formational properties of signs), morphology (word formation rules, derivation, and inflection; complex verbs, classifiers, verb modulations), semantics (the meaning structure of signs), syntax (the structure of the ASL sentence), and discourse and narrative structure (the structure of ASL utterances in terms of old versus new information and the structure of ASL narratives).

PSY 1364 Cognition 4 Q.H.

(Prereq. PSY 1262)

Continuation of PSY 1262, focusing on cognition. This course emphasizes the analysis of perception, memory, and learning within an information-processing framework. Also considered are selected topics in cognitive development.

PSY 1365 Language and the Brain 4 Q.H.

Linguistic behavior from a neuropsychological viewpoint. Models of how the nervous system, and the brain in particular, controls the production, perception, and internal manipulation of language. Localization of cerebral functions and hemispheric lateralization. Experimental and clinical evidence for functional models. Aphasia and other language pathologies. Schizophrenic language. Evidence from "slips of the tongue." The bilingual brain. Comparisons of speech, sign language, and writing systems. Interpretation and translation.

PSY 1373 Abnormal Psychology I 4 Q.H.
(Prereq. PSY 1272 or PSY 1241)

This course offers a study of the abnormal personality, including a historical survey and a discussion of such issues as anxiety, defense mechanisms, and the criteria of psychopathology. Also examined are the symptomatology, etiology, and dynamics of neuroses (hysteria, phobia, obsession, and compulsion) and of psychosomatic disorders. Details of case histories will be discussed.

PSY 1374 Abnormal Psychology II 4 Q.H.
(Prereq. PSY 1373)

The course offers a survey of psychological and somatic therapies. Symptomatology, etiology, dynamics, and therapy of psychoses (schizophrenia, paranoia, mania, depression). Sociopathic and organic disorders.

PSY 1381 Sensation 4 Q.H.

(Prereq. PSY 1112; PSY 1351 is highly recommended)

The course provides an introduction to the study of our senses, with emphasis on hearing, touch, taste, and smell. Students have the opportunity to learn how we measure our sensory abilities. Findings are closely related to the functioning of sensory organs—ears, skin, mouth, and nose—and of the sensory nervous system.

PSY 1382 Perception 4 Q.H.

(Prereq. PSY 1112; PSY 1351 is highly recommended)

The course offers a study of our awareness of the world around us exemplified primarily by visual perception. Topics are explored in group discussions and include light, visual sensory mechanisms, color vision, illusions, consciousness, and dreams.

PSY 1431 Behavior Therapies 4 Q.H.

(Prereq. PSY 1112)

The course offers a study of successful projects that have provided effective remediation and rehabilitation in institutions for the mentally ill, the mentally retarded, and the developing human (schools).

Directed Study— Honors Courses

**PSY 1890, PSY 1891, PSY 1892, PSY 1893,
PSY 1894 Directed Study** (each) 4 Q.H.

(Prereq. Permission of instructor)

This course offers independent work under the direction of the Psychology Department, usually in a research project in one of the department laboratories. Faculty members normally require completion of advanced laboratory courses in the area of research interest, but this is a matter of individual discussion. Students interested in Directed Study should consult a departmental adviser.

PSY 1895, PSY 1896, PSY 1897, PSY 1898, PSY 1899
Junior-Senior Honors Program

(each) **4 Q.H.**

For details contact the Honors Office, 183 Holmes.

Laboratories

PSY 1511 Experimental Design in Psychology
 (Prereq. PSY 1112 and PSY 1212) **4 Q.H.***

The course focuses on the experimental method in the design, execution, analysis, and reporting of psychological investigations of humans and animals.

PSY 1531 Learning and Motivation Laboratory
 (Prereq. PSY 1212 and PSY 1231) **4 Q.H.***

Through direct experience, students have the opportunity to gain proficiency in laboratory analysis of behavior and in evaluating common generalizations about human behavior. Students are expected to design and perform experiments in animal and human learning, memory, decision processes, concept formation, and other topics of individual interest.

PSY 1532 Behavior Modification Laboratory 4 Q.H.*
 (Prereq. PSY 1531 or PSY 1351, and permission of instructor)

Students have the opportunity to participate in education and training of severely and profoundly retarded residents at the Walter E. Fernald State School. Learning theory principles are applied to teaching new skills and to treating inappropriate behavior. Students have the opportunity to write individual and group training programs, implement them in a classroom setting, and learn methods for evaluating program success.

PSY 1551 Laboratory in Neuropsychology 4 Q.H.*
 (Prereq. PSY 1651 or PSY 1351 or permission of instructor)

Students will conduct three separate research projects of which the first two will use rats and the third will use humans as subjects. The three projects will investigate: 1) the effects of intracranial electrical stimulation of reward systems in the rat brain; 2) electroencephalogram (EEG) records of different phases of sleep; and 3) lateralization of function between the left and right cerebral hemispheres. Students will carry out all the phases of experimentation including surgery, behavioral tests, frozen sections and staining of brain tissue in preparation for histological examination of electrode placements, and data analyses. This course will end with oral presentations by students of their research findings.

PSY 1552 Sensory Physiology Laboratory 4 Q.H.*
 (Prereq. PSY 1351)

Experiments are performed to illustrate the physiological techniques in sensory psychology including electrical recordings of some activities that accompany visual, auditory, and cutaneous activity.

PSY 1562 Laboratory in Psycholinguistics
 (Prereq. PSY 1211 and PSY 1262) **4 Q.H.***

The course provides students the opportunity to

acquire first-hand experience in conducting research on problems in the psychology of language. Students are involved in all aspects of each experiment, including collecting and analyzing data and preparing reports. Classroom discussion focuses both on the particular experiments conducted and on the implications of the experimental findings for broader issues in the psychology of language.

PSY 1564 Cognition Laboratory 4 Q.H.*
 (Prereq. PSY 1212 and PSY 1262)

Experiments related to topics in PSY 1262 and PSY 1364.

PSY 1571 Laboratory in Social Psychology
 (Prereq. PSY 1212 and PSY 1271) **4 Q.H.***

The course provides an introduction to the methods of social-psychological research. The purpose of the course is to assist students in developing the ability to read published social research with a critical eye, to pose questions in a testable manner, to apply experimental methods to social research, and to express themselves in APA-journal style.

PSY 1572 Personality Laboratory 4 Q.H.*
 (Prereq. PSY 1212 and PSY 1272)

The course provides an introduction to the methods and areas of personality research. Includes a discussion of problems of measurement, control, and interpretation. Representative published experiments will be examined critically. Students are expected to design, collect data for, assess, and write up several experiments, including one original research project.

PSY 1581 Sensation and Perception Laboratory 4 Q.H.*

(Prereq. PSY 1212 and PSY 1381 or PSY 1382)
 Experiments involving precise measurements of both physical and psychophysical phenomena, including auditory function, color vision and after-effects, muscular sensation, tactile sensitivity, and adaptation to perceptual distortions.

Seminars

PSY 1631 Seminar in Behavior Theory 4 Q.H.

Topics vary from term to term. For specific information, call ext. 3076.

PSY 1632 Seminar in Behavior Modification 4 Q.H.
 (Prereq. PSY 1531)

Topics in behavior modification are discussed in a seminar format.

PSY 1651 Seminar in Neuropsychology 4 Q.H.
 (Prereq. PSY 1351)

For students who desire intensive study, discussion, and practice in laboratory studies of physiological variables. Topics include evolution of the nervous system, sensory and motor mechanisms, motivation and emotion, sleep, attention and perception, learning, and memory.

* Lab fee required.

PSY 1652 Sensory Physiology Seminar 4 Q.H.
(Prereq. PSY 1351)

The course concentrates on the psychophysiology of various sensory systems, vision and hearing in particular. Discussions are concerned with the problem of accounting for sensory phenomena in terms of physiological concepts.

PSY 1661 Seminar in Psycholinguistics 4 Q.H.
(Prereq. PSY 1262 or permission of instructor)

The seminar focuses on the on-line processing of language. Recent research is discussed in light of such questions as: While listening to someone speak, how does the listener process the information carried by the acoustic signal? What is the role of linguistic rules, prediction strategies, and contextual information? And when speaking, what processing stages are involved from the moment the speaker decides to speak to the moment the articulators start functioning? These and other questions will be discussed, as will experimental techniques and current trends in psycholinguistics.

PSY 1662 Seminar in Cognition 4 Q.H.

Topics vary from term to term. For specific information, call ext. 3076.

PSY 1663 Seminar in Linguistics 4 Q.H.
(Prereq. ENG 1118 or PSY 1262 or PSY 3116 or ASL 1102)

This course will vary in topic from year to year but will always involve an overview of the classic literature in some area of linguistics. Possible topics include the history of linguistic theory, phonetics and phonology, syntax and semantics, American Sign Language linguistics, and special topics focusing on a single issue of linguistic theory.

PSY 1671 Seminar in Social Psychology 4 Q.H.
(Prereq. PSY 1271 and SOC 1135, or permission of instructor)

Students are expected to examine and present in class their findings on a particular topic in social psychology, for example, attribution, aggression, conformity, attitude-behavior relationship.

PSY 1672 Seminar in Clinical Psychology and Personality 4 Q.H.
(Prereq. PSY 1373 or permission of instructor)

The course offers seminar presentations of topics relevant to understanding the normal and disturbed personality. Possible topics: specialized assessment procedures, cognitive styles in personality, temperament, hypnosis, anxiety, aggression, specialized clinical syndromes, and the development of conscience.

PSY 1681 Seminar in Sensation and Perception 4 Q.H.
(Prereq. Permission of instructor)

Topics in Psychology Series (TIPS)

General interest, no-prerequisite courses in psychology.

PSY 1214 Psychological Testing: Science and Politics 4 Q.H.

After an analysis of the basic principles of psychological test construction and the characteristics of various tests, the course focuses on the political and sociological problems associated with psychological assessment. Emphasis is on the uses and misuses of tests; social, cultural, and racial issues in intelligence testing; and the heredity-environment controversy in I.Q. testing.

PSY 1215 Sexual Behavior 4 Q.H.

This course is concerned with the sexual activities of the human male and female from infancy to adulthood. It considers the importance of sexual factors in the life history of the individual, statistical surveys of sexual behavior, and direct observational measures of sexual responding. Included are the nature of love, responses to pornography, prostitution, bisexuality, male and female homosexuality, rape, child abuse, and sexual therapy.

PSY 1216 Marriage and the Family 4 Q.H.

Problems typical in some marriages are discussed, including alcoholism, sexual inadequacy and dissatisfaction, separation and divorce, death of a spouse, and child rearing.

PSY 1217 Man in Isolation 4 Q.H.

Children raised in the wilds, children isolated in society, and adults placed in experimental isolation are the subjects of this course, designed to reveal what part of human nature actually requires interaction with other human beings, what part is programmed biologically, and how these work together to make us human.

PSY 1263 Body Language 4 Q.H.

This course examines the messages we send by posture, facial expression, gesture, gait, and interpersonal distance. It goes on to explore how power, status, and gender affect nonverbal communication.

PSY 1264 Animal Communication 4 Q.H.

How do animals communicate and how are we attempting to communicate with them? This course examines and compares the communication systems used by animals such as birds, bees, whales, dolphins, and the primates, including chimps and humans. From the four perspectives of biology, linguistics, psychology, and sociology, recent attempts to teach other primates some of our languages (sign language, speech, manipulation of tokens or computers) are revealing what it means to be a human in the animal kingdom.

PSY 1265 Your Memory: How It Works 4 Q.H.

This course provides an analysis of the operation of memory in humans and animals, including factors from learning and physiology. Special attention is given to human verbal and conceptual memory, and classic and modern systems for memory extension and improvement. Practical exercises on methods of remembering are included.

PSY 1274 Psychology and the Law**4 Q.H.**

How does psychology enter into the various phases of the judicial process? The class traces the effects of psychological factors through the course of a trial, including such issues as accuracy of eyewitness identification, plea bargaining, jury selection, persuasion tactics in the courtroom, presumption of innocence, jury size, jury decision rules, and sentencing and punishment.

PSY 1281 Magic and Illusion**4 Q.H.**

This course investigates visual, auditory, and kinesthetic illusions and constancies, demonstrating the manner in which we can be misled by our perceptions and how professionals, such as magicians (who will demonstrate certain topics), take advantage of this fact.

Anthropology

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office before taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

SOA 1100 Introduction to Anthropology**4 Q.H.**

The course provides a survey of basic anthropological concepts, including human evolution, culture, and linguistics, with comparative analysis of such socio-cultural institutions as kinship, economy, polity, and religion, especially in non-Western societies.

SOA 1101 Cultural Meaning and Everyday Experience**4 Q.H.**

This course uses anthropological ideas to study the underlying patterns of meaning that lie below the surface of everyday thought and behavior. Topics include study of daily routines, leisure activities, joking and humor, speech patterns, current folklore and mythology, nonmonetary economic transactions, kinship and friendship relations, and religion and ritual.

SOA 1102 Evolution and Society**4 Q.H.**

This course focuses on human social and cultural evolution and the theories that account for it.

SOA 1103 Culture in Transition**4 Q.H.**

The course offers analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

SOA 1104 Cultures of the World**4 Q.H.**

This course is designed to introduce the student to societies around the globe. By intensively examining a number of societies, the student will be exposed to the factors enabling cultures to develop their unique patterns. Primary emphasis will be on developing the ability to compare and contrast societies in a controlled and valid way, as well as looking at societies in a constant attempt to adapt to changing environments. (II)

SOA 1120 Visual Anthropology: Camera on Culture**4 Q.H.**

(Prereq. SOA 1100)

This course explores the anthropologist's use of film to gather information and analyze cultural subsystems. In addition to reading about and viewing films on particular peoples, a "laboratory" aspect of the

course involving the use of tape and video equipment introduces students to the field.

SOA 1125 Introduction to Archaeology**4 Q.H.**

This course offers a survey of the history of development of archaeology focusing intensively on key sites in the new and old worlds. Film and slides of sites and artifacts are used extensively.

SOA 1135 Language and Culture**4 Q.H.**

Topics include the function of language in human society and an introduction to the relation between the patterns of language and the patterns of culture.

SOA 1145 Peoples Who Live by the Sea**4 Q.H.**

Course material includes examination of fishing, trade, shipbuilding, recreation, smuggling, and other uses of the sea; the social ecology, lifestyles, economics, and politics of seacoast perspectives of evolutionary and community systems theory. Research projects dealing with current issues, site visits, and field trips are required.

SOA 1146 Peasant Society and Culture**4 Q.H.**

Focuses on the dilemma of attempts by peasant societies to preserve traditional cultural forms in the face of increasing external economic and political pressures. Covers the origins of the peasantry, diversity and uniformity in peasant societies, the transformation of peasants into the modern urban and rural poor, and the politics of peasant protest and revolution. (IV)

SOA 1155 Individual and Culture**4 Q.H.**

This course explores the ways in which individuals are shaped by society and the ways in which they can effect change.

SOA 1160 Sex, Sex Roles, and Family**4 Q.H.**

The course analyzes popular and scientific notions about sex and family by examining the social patterning of interactions in our culture, other cultures, and other species. Emphasizes the changing relations between men and women. (See also SOC 1160.)

SOA 1185 Aggression 4 Q.H.

Focuses on concepts of aggression and how they affect our understanding of human society. Draws on materials collected by anthropologists, psychologists, and ethnologists.

SOA 1220 Culture and Mental Illness 4 Q.H.

This course offers discussions and analyses of the nature and meaning of culture, the role of culture in personality formation, culture and anxiety, anthropological approaches to the "normal" and the "abnormal," and the question "Is mental illness psychological fact or cultural fiction?"

SOA 1265 Primitive Religion 4 Q.H.

The course focuses on nature and institutionalization of "primitive" religion. Topics include exploration of religious concepts and movements in relation to social, economic, and political organization.

SOA 1266 Folklore 4 Q.H.

This course focuses on cross-cultural comparisons of oral narrative traditions and literary sources. Various methods of analysis of folklore and its place and function in society and culture are examined. Identification of and methods for collecting material from local currently active folklore traditions are given special attention.

SOA 1267 The Anthropological Study of Myth 4 Q.H.

The course focuses on theories concerning the nature and meaning of myth. Exploration of the function of myth in social and cultural change. The structural analysis of myth.

SOA 1275 The Anthropology of Music 4 Q.H.

This course offers an examination of music in a prehistoric and cross-culture perspective, with emphasis on ethnomusicology and the comparison of Western and non-Western musical culture. Functions and social contexts of musical composition and performance; the ethnography of musical performance groups; the analysis of music as a form of communication.

SOA 1300 Cultural Ecology 4 Q.H.

The course offers an introduction to questions of human adaptation to environment and the effect of different adaptations on natural systems.

SOA 1301 Human Origins 4 Q.H.

The course offers an intensive look at the data on fossil remains and contemporary primates, which are essential for an understanding of human physical and behavioral evolution. Efforts are made to bring the student into direct contact with primary materials. (II)

SOA 1310 Social Change and Economic Development 4 Q.H.

Selected topics in the socioeconomic transformation of the world produced by the industrial revolution. Focuses on the impact of the modern world system on traditional cultures and contemporary Third World countries.

SOA 1320 Anthropology Methods 4 Q.H.

The course examines theory and practice of methods of field research and data analysis. Students have the opportunity to take part in a field project.

SOA 1335 Language and Communication 4 Q.H.

The course focuses on human communication, including language, theories of the evolution of language; language and kinesics, semiotics, social class, linguistic nationalism; linguistic problems in modernization.

SOA 1345 Urban Anthropology 4 Q.H.

The course explores selected problems in anthropological studies in urban societies.

SOA 1355 Political Anthropology 4 Q.H.

The course investigates the origin and growth of the institutions of civilization. Topics include specialization and social stratification in the dynamics of traditional civilizations. Some special topics of contact and change.

SOA 1356 The Anthropology of Law and Conflict 4 Q.H.

Topics include settling disputes in stateless societies; forms and mechanisms of social control; law as an indicator of cultural and social norms; the study of conflict resolution as an ethnographic tool. Some field research and analysis are required.

SOA 1360 Economic Anthropology 4 Q.H.

The course examines types of economic systems in simple societies: reciprocal, redistributive, market exchange; economic relations as part of social relations; land-tenure systems, credit systems, savings mechanisms. The transition from subsistence to cash economics.

SOA 1420 Kinship and Society 4 Q.H.

This is a course for the advanced student only. A variety of kinship systems, their terminological and structural components, and the way in which they articulate with other social institutions are studied.

SOA 1425 Tribal Societies and Cultures 4 Q.H.

The course focuses on the structures and institutions of bands, tribes, and chiefdoms; comparative and functional studies of tribal societies and the dynamics of change under contact situations.

SOA 1430, SOA 1431, SOA 1433, SOA 1434, SOA 1435, etc. (each) 4 Q.H.

These are ethnographic area courses (New World Indian, African, Chinese, Indian, Mediterranean, etc.) which will be offered as the department's resources permit.

SOA 1432 People and Culture of China 4 Q.H.

This course introduces students to anthropological analysis in the context of Chinese ethnographic material. Topics covered may include kinship, markets, economics and social class, rituals, both folk religions and elite beliefs. The cross-cultural approach used enables students to apply the analytical concepts of anthropology not only to China but also to

their own culture, so that they may see that Chinese culture is different but the patterns in people's lives are dominated by themes that are shared by humans everywhere. (IV)

SOA 1470 Religion and Myth 4 Q.H.

Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and movements in relation to social, religious, and political organization.

SOA 1800, SOA 1801 Directed Study 4 Q.H.

(Prereq. Department approval)

The course offers independent work on a chosen topic under the direction of members of the department. Limited to qualified seniors preparing in anthropology with approval of the department chairperson.

SOA 1820, SOA 1821, SOA 1822, SOA 1823

Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

SOA 3100 Theory

4 Q.H.

Qualified undergraduates may wish to take this graduate school course. Permission of the instructor is required for registration.

INT 1340 Cultural Aspects of International Business

4 Q.H.

(Prereq. Middler standing)

Using a managerial perspective, this course covers issues that arise when a firm moves from its home country to a host country that may have a different national culture. Although it will usually assume the perspective of the United States-based firm that operates abroad, it will spend some time on what happens to other national firms operating in the United States and in third-country environments. The way in which "corporate culture" evolves, in the context of national culture and the impact on managers, will be a central issue.

Sociology

SOC 1100 Introduction to Sociology 4 Q.H.

The course explores basic concepts and theories concerning the relation between individuals and society. Emphasis on the influence of culture, social structure, and institutions in explaining human activity. Social groups, socialization, community, class, power, and social change, among other substantive issues, will be discussed and analyzed.

SOC 1101 The Sociology of Everyday Life 4 Q.H.

The course examines the development, application, and consequences of rules for everyday activities. (e.g., walking, talking, eating, drinking, sitting, smoking, laughing, crying, and sleeping); the effects of artifacts, culture, space, and territory on these activities, on social life, and on the expression of emotions.

SOC 1102 Social Inequality and Communication

4 Q.H.

The course provides an analysis of the ways in which groups and institutions, in both their ritual and everyday activities, communicate the idea of hierarchy and an individual's place in it through face-to-face interaction, formal communication, and the use of space and time. A dramaturgical approach to social organization with special emphasis on status images in the media and the communication of social place by service organizations and professional groups. Includes some content analysis and observational fieldwork.

SOC 1103 American Society 4 Q.H.

(Prereq. SOC 1100 or equiv.)

The course focuses on American society, culture, and major social institutions: economic, religious, governmental, familial, educational, welfare, and recreational; social classes and stratification, mobility, and individualism.

SOC 1104 Contemporary Japanese Culture and Society 4 Q.H.

Focus on contemporary Japanese urban society. Topics include: major values, family structure, sex roles, social control, the economy and the division of labor, mass media, religion, arts, and social problems.

SOC 1120 Sociology of Boston

4 Q.H.

(Does not meet elective requirement for sociology/anthropology major)

The course examines the city of Boston from the perspectives of environmental development, neighborhood and intergroup relations, institutional services, and symbolic meanings. The city is a laboratory for exploring people's search for a lifestyle and the satisfaction of their needs. Field trips with workbook are required. Documentary and literary sources for term paper report are used.

SOC 1121 Doing Sociology

4 Q.H.

A research approach to sociology. Focus on students' participation in their own learning about sociology as a body of knowledge and as a method of studying social life. Students will use the computer during the course. (II)

SOC 1125 Social Problems

4 Q.H.

(Prereq. SOC 1100 or permission of instructor)

The course offers analysis of five major sociological perspectives on social problems (pathology, disorganization, value conflict, deviance, and labeling); the conditions under which certain recurrent events, activities, and persons become redefined as social problems (e.g., mine disasters, marijuana smoking, and alcoholism); study of the typical responses to social problems and their consequences.

SOC 1135 Social Psychology 4 Q.H.

(Prereq. SOC 1100 or permission of instructor)

The course offers a sociopsychological approach to individual behavior in social contexts; introduction to basic concepts, such as socialization, identity, self-concept, role conflict, attitudes and attitude measurement, and groups and group processes as well as an overview of major theoretical orientations and important substantive topics.

SOC 1140 Sociology of Prejudice 4 Q.H.

(Prereq. SOC 1100 or permission of instructor)

This course examines factors in the development and maintenance of prejudice and discrimination. Topics include American race relations, anti-Semitism, sex roles, and stereotyping.

SOC 1145 Population and Society 4 Q.H.

The course examines traditional and contemporary approaches to human population and its control. Topics include factors affecting birth and death rates; societal implications of population quantity and quality in several situations, past and present; rural-urban migration and mobility; racial, genetic, stratificational components for population analysis. Public policies and responses to fertility control in several societies. International efforts to understand and generate action on population issues. (VI)

SOC 1146 Environment and Society 4 Q.H.

This course examines the complex relations between human populations and their environments. Issues such as energy, pollution, food supplies, resource availability, and conservation are treated as societal phenomena that involve human values and decision-making processes as well as technical information from a variety of scientific fields. The course will include practical experience in environmental problem solving. (VI)

SOC 1147 Cities and Society 4 Q.H.

(Formerly Urban Society)

Topics include the foundations of urban life in historical perspective; relation of city life to environment, population, social organization, technology and cultural values; growth trends, urbanization, urban planning, and citizen action.

SOC 1155 Sociology of the Family 4 Q.H.

Topics include the family as a social institution in several selected cultures; interrelations of the family and political, economic, and educational institutions; social nature of personality; role taking; individualism, mobility, and industrialism. (V)

SOC 1156 Violence in the Family 4 Q.H.

The course offers an examination of the physical, emotional, and sexual violence that occurs in families, with particular emphasis on child and spouse abuse. Definitions, prevalence, causes, prevention, and treatment of specific cases of domestic violence are analyzed. Social policy issues and problems of legal intervention are a primary focus.

SOC 1160 Sex-Gender Roles in a Changing**Society****4 Q.H.**

The course offers review and application of theories about the determinants of sex statuses and roles, from historical and cross-cultural perspectives. The focus of the course is on women's status in different institutional structures of American society.

SOC 1165 Students, Schools, and Society 4 Q.H.

(Prereq. SOC 1100)

This course emphasizes the role of education in processes of socialization, social mobility, social control, and social change. Do social characteristics (sex, race, class, age, physical status) influence the school experience? Do schools provide opportunity and initiate change, or do they perpetuate the status quo in economic, political, and social life? Who goes to school, where, for how long, and with what result? How does educational advantage or disadvantage get translated into jobs and social status? Students are encouraged to draw on their own experiences to develop paper topics.

SOC 1170 Race and Ethnic Relations 4 Q.H.

(Prereq. SOC 1100 or equiv.)

The course focuses on racial and religious groups, particularly with reference to the United States; special emphasis on historical development, specific problems of adjustment and assimilation, and specific present-day problems and trends.

SOC 1171 Race and Ethnic Relations: A World Perspective 4 Q.H.

(Formerly Comparative Race/Ethnic Relations)

This course offers a cross-cultural analysis of race and ethnic relations in Western and non-Western societies. Explanations of race and ethnic relations in terms of contemporary developments, world problems, and ideological conflicts are included.

SOC 1175 Sociology of Work 4 Q.H.

This course examines the varieties of work in American society, from blue collar to managerial and professional occupations. Topics include job dissatisfaction and professional burnout, changing shape of the labor market, women and work, participation and humanization of work, the impact of computers. (VI)

SOC 1176 Sociology of Business/Industry 4 Q.H.

The course focuses on the role of industry in modern society; similarities and dissimilarities among industrial societies, bureaucracy and its alternatives, unions, supervision democracy and manipulation, the worker on the assembly line, sabotage of the organization, and the role of wages and alienation.

SOC 1177 Social Roles in the Business World**4 Q.H.**

The course offers an analysis of the social structure of corporate and business life in contemporary America. Case studies from major accounting and/or industrial firms are presented and discussed. The "career line" in the world of business and management will be examined with a special focus on age/sex, racial/ethnic, and class/income barriers.

SOC 1178 Women Working**4 Q.H.**

Differences in the labor force experience of men and women workers generally go unrecognized, and the work experience most common to women—household work—is rarely analyzed. This course will cover women's market and nonmarket activities, their rewards, and their problems, in addition to empirical and theoretical analyses of the work roles of women. Overall, the course will underscore the differences between work experiences of men and women.

SOC 1180 Sociological Perspectives on**Consumerism and Consumer Behavior****4 Q.H.**

The course offers an analysis of consumer-oriented issues, including interest groups, needs, values, institutional networks, decision-making processes, and situational impacts. Exploration of systemic benefits and costs of consumer-relevant actions.

SOC 1185 The Sociology of Deviance**4 Q.H.**

(Formerly Social Deviance)

The course explores the conditions under which people categorize others as different; processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images; development of deviant careers and their relation to deviant subcultures; situations in which people transform deviant identity.

SOC 1186 Social Control I**4 Q.H.**

The course examines formation of social bonds and the conditions under which they are ruptured; the emergence of deviance as an interactional problem; individual and societal reactions to the most prevalent forms of deviant behavior. Analysis of agencies of social control, their definitions of problems, and responses to typical clients.

SOC 1190 Juvenile Delinquency**4 Q.H.**

The course examines the sociological and psychological approaches to and their implications for a typology of delinquency; problems of prevention, treatment, and rehabilitation.

SOC 1195 Drugs and Society**4 Q.H.**

The course offers an introduction to the sociology of drugs. The course first examines social definitions of drugs, conditions of their use, and socialization into drug use. It then considers deviant drug use and effects of social control on definitions and use. A range of licit and illicit drugs will be considered, but major emphasis will be given to alcohol, marijuana, and heroin.

SOC 1200 Sociology of Alcoholism**4 Q.H.**

The course focuses on social responses to deviant alcohol use. The course examines, in sequence, drinking cultures and drinking practices in the United States; processes by which people are labeled "alcoholics"; and the role of agencies of social control, such as the criminal justice system and the health care system, in labeling and in rehabilitation.

SOC 1201 Alcohol Use and Social Control**4 Q.H.**

All societies define and enforce rules on the use of alcohol. This course examines the conditions under

which alcohol use disrupts social life; the processes through which alcohol controls, informal and formal, come into being; the development changes and consequences of these controls. Case studies of Prohibition, regulation of the alcohol beverage industry, legal drinking age, drinking and driving, and public drunkenness will be included.

SOC 1202 Sociology of Drinking**4 Q.H.**

In most of the societies in the world, people drink alcoholic beverages. This course examines how different groups and societies organize drinking as a social act, and the consequences of that organization. It singles out for particular attention the cultural meaning assigned to drinking, the social elements found in all drinking situations, how members of social groups learn how to drink, and the social and psychological functions of drinking.

SOC 1205 Law, Crime, and Social Justice**4 Q.H.**

Analysis of the impact of the legal system on the creation and perpetuation of criminality in contemporary American society. Particular attention is devoted to the study of the creation of criminal law, the judicial process, and the role of law in the gap between crime and social justice. Field trips will focus on criminal arrangements, trials, and sentencing in the Boston Municipal Court and Suffolk Superior Court. Suitable for students in prelaw, criminal justice, political science, and allied fields.

SOC 1206 Class, Crime, and the Police**4 Q.H.**

This course summarizes the major psychological, social, biological, economic, and political theories about the cause of crime. It then applies these theories to the day-to-day operations of the police, courts, and prison system in the United States. Various attempts to lower the crime rate through such policies as "scared straight" programs, the death penalty, stricter and looser prisons, increased police presence, and behavioral conditioning will be examined.

SOC 1215 Medical Sociology**4 Q.H.**

(Prereq. SOC 1100 or permission of instructor)

The course provides an examination of the professions, training, institutions, and problems in health care, with an emphasis on those in the United States. Practical issues in the improvement of health care systems are considered.

SOC 1216 Health Care as a Social Issue**4 Q.H.**

(Prereq. SOC 1100 or permission of instructor)

The course explores the social and political dynamics of health care: who benefits from the system and defends it, who works for change, who wins and why. Topics include the social history of health care, occupational politics, community power structure and the health care setting, the planning and delivery of health services to "haves" and "have-nots," and the role of citizens in determining the future of health care through activism, lobbying, legislation, and participation in controlling the system. Case examples will be provided.

SOC 1217 Women, Health, and Social Change**4 Q.H.**

The course will examine how women have traditionally been viewed by the medical field and how reproduction and childbirth came to be defined as medical problems. It will also examine the implications for women in the changes that have taken place in health care, especially as these pertain to new reproductive frontiers and alternative health care facilities. The role of women in the health care professions will also be examined.

SOC 1220 Sociology of Mental Health**4 Q.H.**

(Prereq. SOC 1100 or equiv.)

The course provides a survey of sociological perspectives on mental health and mental disorder. Discussions, readings, and presentations explore the social history of mental illness, epidemiology, cross-cultural perspectives, patients' careers, social institutions of treatment, and policy implications. Areas of convergence between sociological concepts and psychiatry are examined.

SOC 1225 Aging and Society**4 Q.H.**

The course offers a survey of issues and questions on aging, with special attention to social and economic consequences of the aging process, including retirement and productivity, health care problems, nursing home residences, widower- and widowhood, and the approach of death. Examples relating to aging in other cultures are presented in a search for new answers to social problems of aging in the United States. Students have the opportunity to learn to anticipate, cope with, and even prevent problems of aging that concern self, family, and clients/patients.

SOC 1235 Death and Dying**4 Q.H.**

(Prereq. SOC 1100 or permission of instructor)

The course focuses on the treatment of death and dying, including problems faced by health care professionals, family members, institutions, the funeral industry, and the dying themselves. The course will discuss cross-cultural perspectives, the social distribution of mortality, the changing nature of death, and the ethical problems in determining life and death with particular attention to such issues as abortion, suicide, and ceasing medical intervention.

SOC 1240 Sociology of Human Service Organizations**4 Q.H.**

This course explores the contradiction between what human service organizations set out to do and what they actually accomplish. The course also explores how the goals of human service organizations are defined, how clients become labelled, and the societal constraints on clients, workers, and human service organizations.

SOC 1245 Sociology of Poverty**4 Q.H.**

The course offers an analysis of American poverty in historical perspective, drawing on comparisons with other countries. Critical evaluation of sociological research and theories relating to poverty. Consideration of causes and effects of poverty, as well as societal responses to poverty and its consequences.

Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, premed, and prelaw.

SOC 1247 Food and Hunger**4 Q.H.**

Systematic examination of the social causes and consequences of hunger, and alternative approaches to solving world hunger.

SOC 1250 The Sociology of Private and Public Assistance**4 Q.H.**

The goal of this course is to help students understand why public and private assistance in the United States takes the form it does. Topics covered include the ideology behind the welfare system, the kinds of assumptions made about the poor, how other countries deal with the problem, the effects of poverty in the United States, and some explanations for its continuing existence.

SOC 1255 Sport in Society**4 Q.H.**

The course provides an analysis of the social origins and functions of leisure activities, with special emphasis on games and sports as forms of leisure. Considerable emphasis is given to cross-cultural and historical analysis as well as to the relation between leisure activities and various social institutions—economy, polity, family, and religion.

SOC 1275 Sociology of the Arts**4 Q.H.**

The course offers an examination of the relation between the social organization of society and the forms of art produced—the social role of the artist, how the arts are “manufactured” and distributed, the art consumer’s relation to art and the artist, social support for the arts. The course deals with a variety of art forms, with emphasis on the performing arts.

SOC 1276 Sociology of Popular Culture**4 Q.H.**

A sociological analysis of popular culture, focusing on the relationship between pop culture and social institutions such as religion, the law, education, the economy, and the family; the organizations and artistic communities that produce pop culture such as the music industry, theatrical groups, advertising agencies; and the social roles and socialization processes associated with individual artists. Changes in popular culture are examined from the viewpoint of changes in the larger society.

SOC 1284 Technology and Careers of the Future**4 Q.H.**

Introduction to new technologies and their social impacts on work and careers in the future. Sociological and humanistic approaches to technical change will be examined in the shop floor, offices, and professions. Course will focus on issues of design and control, health, employment, and autonomy.

SOC 1285 Technology and Society**4 Q.H.**

Does society control technology or is technology directing society? Has technology become dehumanized? How valid is the doctrine of technological inevitability? Can the technological “fix” be viewed as a solution to social problems? Is technology itself a social problem? What can be expected of technology

assessment? What of the back-to-nature and anti-technology movements today: are they the waves of the future? These are some of the questions and issues that are discussed and analyzed. Students are expected to do considerable independent study and research.

SOC 1286 Science and Society 4 Q.H.

Science has had profound effects on our society, and scientists have seen the ways in which political, economic, and social forces have guided developments in their fields. Issues such as "responsibility" and "autonomy" created by this interdependence will be explored. Emphasis is on the social structures within which science operates and is communicated, and on science as an occupation and profession, as well as a system of thought and set of tools for producing knowledge.

SOC 1287 Society Tomorrow: Forecasting Alternative Futures 4 Q.H.

This course introduces students to the area of Social Futures or Future Studies. Included in the topics covered will be the major techniques used to forecast futures and the examination of specific scenarios and projections about the social world of tomorrow. Using the areas of energy and resources, robotics and the "information revolution," as well as modern weaponry and warfare, we will consider the major prospects and problems for society in the future.

SOC 1290 Military and American Society in a Nuclear Age 4 Q.H.

Keeping out of war, winning war, and keeping peace have been major concerns during the past forty-five years. In this course, we will investigate the relationship between military and society. Selected issues will include: 1) an analysis of the impact of the military on social institutions such as the family, polity, and economy; 2) an examination of the arms race and upheaval in social life; 3) the legitimization crisis of the U.S. military; 4) the role of women and minorities as reserve armies; and 5) military spending and domestic social problems.

SOC 1300 Classical Social Thought 4 Q.H.

(Prereq. Three sociology/anthropology courses)

The course examines the development of sociology from the history of social thought. The emergence of several schools, beginning with positivistic organicism and conflict theory.

SOC 1301 Current Social Thought 4 Q.H.

(Prereq. Three sociology/anthropology courses)

A seminar-lecture course in which formalism, social behaviorism, social action theory, and functionalism are studied critically.

SOC 1302 Female Perspectives on Society 4 Q.H.

(Formerly Feminist Perspectives on Society)

This course examines a sampling of the burgeoning feminist literature in the social sciences and in theory, focusing on at least three major tendencies in this literature: radical feminism, socialist feminism, and neo-Freudian feminism. Specific topics include the

origins and/or universality of women's oppression; women's work under capitalism; socialism and women's liberation; and family structure and the reproduction of gender. (VI)

SOC 1310 Class, Power, and Social Change 4 Q.H.

(Prereq. SOC 1100 and junior or senior standing in sociology/anthropology or permission of instructor)

The course focuses on theories of social equality and inequality as applied to the exercise of power and the growth and development of social movements and group conflict as seen from the point of view of large-scale social change. Required of majors. (V)

SOC 1320 Introduction to Statistical Analysis 4 Q.H.

(Prereq. SOC 1100 or permission of instructor)

This course examines the application to social data of the principles of measurement, probability, measures of centrality, tests of significance, and techniques of association and correlation.

SOC 1321 Research Methods I 4 Q.H.

(Prereq. SOC 1100 and SOC 1320, or permission of instructor)

This course introduces students to the research process through an examination of the rules of evidence in empirical research and the place of values. Students have the opportunity to learn how to design and critique types of sociological research, how to collect qualitative and quantitative data, and how to sample populations.

SOC 1322 Research Methods II 4 Q.H.

(Prereq. SOC 1100, SOC 1320, and SOC 1321, or permission of instructor)

Students are required to complete the research project begun in Research Methods I; practice coding, building indexes, scaling, table construction; introduction to use of the computer.

SOC 1323 Qualitative Research Methods 4 Q.H.

The course offers an introduction to sociological fieldwork—methods of gathering data by extended observation of and interaction with people in natural settings. Students will take part in a series of observations designed to teach the basic skills of open-ended interviewing, observing, recording, and analyzing data. The theoretical base will be symbolic interaction.

SOC 1324 Human Services Research and Evaluation 4 Q.H.

(Prereq. SOC 1320 or other statistics, SOC 1240, or permission of instructor)

This course covers basic issues in applied research and the evaluation of services, including attention to the purposes of evaluation, ethics, formulating questions and measuring answers, designing evaluations and planning oriented research, utilizing evaluation results, and the turbulent setting of action programs. Suitable for students majoring in human services, sociology, psychology, nursing, health education, and related fields.

SOC 1335, SOC 1336 Group Behavior I and II**8 Q.H.**

(Formerly Group Behavior—The Sociological Imagination)

The course explores how individuals interact in groups and how groups interact with each other. The reflexive self, social aspects of language, situational learning, group perspectives, careers, institutions, and worlds.

SOC 1337 Seminar in Social Psychology 4 Q.H.

Focus is on the interaction of psychological and group processes. Students are required to read original theoretical and research monographs in the field. Topics may include prejudice, reference groups, sex roles, conformity, leadership, aggression, communication, collective behavior, and achievement.

SOC 1345 American Demographics 4 Q.H.

This course is essentially an applied research experience in which students have the opportunity to study the major areas of demography. The focus of the course is on the resources of the U.S. Census Bureau and, in particular, the data products available from recent census surveys.

SOC 1346 Suburb and Metropolis 4 Q.H.

(Prereq. SOC 1100 or equiv.)

The course explores ecology of suburban and metropolitan growth, impact on center city and rural fringe, emergent lifestyles and institutional forms. Compares interdependence, issues of identity, autonomy, and accessibility. Analysis of different types of metropolitan political, social, and economic institutions. Prospects for regional action.

SOC 1347 Community Analysis 4 Q.H.

(Prereq. Permission of instructor or three sociology/anthropology courses)

This course explores types of human settlements, focusing on the interaction between people and their political, economic, and social environments. Topics include power structure and citizen action to influence institutions; skills in community analysis, including use of documents, survey, observation, and evaluation of needs and resources; strategies of conflict, cooperation, and negotiation to attain community and group ends.

SOC 1348 Seminar in Urban Studies 4 Q.H.

(Prereq. SOC 1147 or permission of instructor)

Interdisciplinary approaches to urban studies are compared according to problem areas and research methods. Students have the opportunity to extend previous term paper projects after exposure to social action and social systemic theoretical perspectives.

SOC 1355 Political Sociology: Who Gets What**4 Q.H.**

(Prereq. Permission of instructor or four sociology/anthropology courses)

This course offers an examination of formal political structures and informal quasi-political groups. Topics include sociological analysis of ideology, class politics, mass movements, and the conflict of various

social and economic groups as they vie for political power and influence.

SOC 1360 Social Stratification: Class, Status, and Power**4 Q.H.**

(Prereq. Permission of instructor or four sociology/anthropology courses)

Topics include theories of social inequality, concepts of social class, aspects of status and role difference, criteria for social mobility.

SOC 1365 Collective Behavior**4 Q.H.**

Topics include the rise of new group forms in response to persistent social unrest; study of masses, crowds, and publics; analysis of specific instances of collective behavior such as race riots, wildcat strikes, prison revolts, and campus disorders.

SOC 1375 Sociology of Occupations and Professions**4 Q.H.**

(Prereq. Permission of instructor or four sociology/anthropology courses)

Topics include the meanings of work; division of labor and specialization; analysis of occupational structure and patterns of recruitment, training, and career preferences; the classic professions and new trends in professionalization.

SOC 1376 Organization and Bureaucracy 4 Q.H.

Sociological study of organizations. Case studies of private corporations, federal bureaucracies, social service agencies, military-industrial complex, high-risk technological systems, unions. Recent theories of innovation, participation, and opportunity in complex organizations.

SOC 1385 Social Deviance II**4 Q.H.**

The course offers an examination of the leading theories of deviance (anomie, subcultural deviance, labeling) and their principal variants; study of their assumptions, conceptions, propositions, and supportive evidence; analysis of empirical studies in each theoretical tradition.

SOC 1405 Sociological Theories of Crime 4 Q.H.

The course explores patterns and social forces involved in criminal behavior. Analysis of sociological theories of criminality and comparison of these with other explanations of crime.

SOC 1470 Sociology of Religion**4 Q.H.**

(Prereq. SOC 1100)

The course offers a comparative and analytic treatment of religion as a social institution, focusing on the relations between religious organizations and other social institutions, with particular emphasis on the American experience. Religion as an agent of social change and stability is included.

SOC 1475 The Sociology of Mass Communication**4 Q.H.**

(Formerly Mass Communication and Public Opinion)

Topics include factors in the formation and development of public opinion, the effect of television on children, mass communication as social organization, media-depicted images of society, the role of personal

influence, the process of rumor, the use of mass media by the poor, propaganda analysis, and the latent and manifest functions of mass communication.

SOC 1485 Computers and Society 4 Q.H.

(Prereq. Ability to program a computer)

Examines the impact of the computer "revolution" on the conditions of work and life in contemporary society and on legal and theoretical conceptions of human society and consciousness.

SOC 1500 Applied Sociology: Practice and Theory 4 Q.H.

The course provides an analysis of the conditions under which sociological knowledge is applied to social problems, the kinds of problems, and the degree of effectiveness of this application. Particular attention is paid to research and demonstration projects that derive from sociological theory.

SOC 1501 Social Policy and Social Intervention 4 Q.H.

(Formerly Social Control II)

The course focuses on study of the formation of social policies in response to social problems, analysis of policies and problems, supporters and opponents of policy change, conditions under which control agencies adopt new policies, and effects of policy change. Particular emphasis on case studies of social action and legal change.

SOC 1525 Comparative Human Services I 6 Q.H.

This course offers an intensive look at the American human services system. The course is designed to afford upper-level undergraduate and graduate students the opportunity to study the origins, development, and present state of human services in the United States. The course involves lectures as well as field visits in the Boston area. In addition to the normal classroom activities, independent study is provided.

SOC 1526 Comparative Human Services II 6 Q.H.

This course offers an intensive study of the British human services system. This course provides students the opportunity to immerse themselves in the social and cultural context of British human services and involves field trips in London designed to examine firsthand the planning, administration, and delivery of human services in Great Britain.

SOC 1535 Seminar in Social Welfare 4 Q.H.

Discussion of problems in social welfare observed in the term between "Problems" and "Practicum." A research paper, based on directed fieldwork in the intervening term, is the major course requirement.

SOC 1600 Senior Seminar 4 Q.H.

(Prereq. Senior standing in sociology/anthropology or permission of instructor)

The course provides the opportunity to analyze, from sociological perspectives, student experience in work and voluntary service and to develop and extend research interests related to that work or action experience.

SOC 1601 Seminar in Current Emphases in Sociology 4 Q.H.

(Prereq. Junior or senior standing in sociology/anthropology or permission of instructor)

This course offers review and discussion of selected sociological topics.

SOC 1602 Seminar in Current Emphases in Sociology: Writing and Talking in Sociology 4 Q.H.

(Prereq. Junior or senior standing in sociology/anthropology or permission of instructor)

The class considers prevailing modes of presentation in major journals and verbal presentation in teaching, consulting, etc. Class members are required to submit examples of their own writing for analysis.

SOC 1800, SOC 1801, SOC 1802, SOC 1803 Directed Study (each) 4 Q.H.

(Prereq. Junior or senior standing in sociology or permission of instructor)

The course offers independent work on a chosen topic under the direction of members of the department. Limited to qualified students with approval of department chairperson.

SOC 1819 Drinking in College (Honors Minicourse) 1 Q.H.

This minicourse looks at drinking in college through the eyes of social scientists, humanists, college administrators, and college students themselves. One of its goals is to help undergraduates arrive at a broader and more comprehensive understanding of the place of alcoholic beverages and controls on their use in campus society. The course surveys college drinking patterns in the United States from its beginnings to the present.

SOC 1821, SOC 1822, SOC 1823, SOC 1824 Junior-Senior Honors Program (each) 4 Q.H.

For details contact the Honors Office, 183 Holmes.

INT 1150 Introduction to Women's Studies: Image, Myth, and Reality 4 Q.H.

This is an introductory survey of the issues and methodology involved in the interdisciplinary study of women. Such a survey encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in society. Guest lecturers provide an overview of the many different disciplinary approaches to the study of women. This course is required for women's studies minors and may be used either as a general elective or, depending upon the discipline of the coordinator, to satisfy specific concentration requirements. (II)

INT 1151, 1152 Women's Studies: Seminars in Research 4 Q.H.

These Interdisciplinary Women's Studies Seminars allow students to address problems in depth by researching a topic of particular interest. Careful development of a research plan is encouraged and opportunities are provided for sharing work in progress and for exchanging findings. These findings involve little in-class time, but much consultation with

appropriate faculty. The final product of seminar work and research is a major paper. Students in the Honors Program may substitute one quarter of honors registration for each seminar, but are still expected to attend the formal sessions of the seminar. These seminars are required for women's studies minors.

INT 1201 An Analysis of American Racism 4 Q.H.

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which our attitudes, in turn, shape our institutions. Emphasis is on the practical, day-to-day aspects of racism, rather than the theoretical and historical.

INT 1215 Into the Ocean World 4 Q.H.

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but, when appropriate, we will focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1400 Professional Practices: Individual and Social Dimensions 4 Q.H.

The course explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socioeconomic conditions, by clients, and by other professionals. Case histories are examined to illustrate the dilemmas professionals face, the choices that are typically made, and the consequences these have on the freedom of the practitioner, and on personal and professional integrity.

INT 1401 Health Professions: Past, Present, and Future 4 Q.H.

This course focuses on social history of the modern health professions. The course explores long-range patterns in the organization and regulation of the health professions, beginning with the Middle Ages and emphasizing the Jacksonian period, industrialization, modern professional organizations, the growing role of the state, responses of the health professions, and the future of health care in the United States under various corporate/government schemes for reorganization and "accountability."

Speech Communication

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Dean's Office *before* taking the course.

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

SPC 1102 Effective Speaking 3 Q.H.

(Prereq. Industrial engineering students only; speech communication for specific purposes)

Designed to help provide the student with a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people, the course examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

SPC 1106 Speech Fundamentals 3 Q.H.

(Prereq. Recreation majors only; speech communication for specific purposes)

This course is designed to give the student an opportunity to develop a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people. It examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

SPC 1109 Effective Speaking Workshop 2 Q.H.

(Prereq. Civil engineering students only)

This course is designed to give the student an opportunity to acquire a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people. It examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

SPC 1110 Voice and Articulation 4 Q.H.

The course includes the study of voice technique: emphasis on pitch, projection, articulation, and vocal variety. A combination of theory and practical application.

SPC 1111 Oral Interpretation 4 Q.H.

The course focuses on application of basic vocal techniques to the dramatic reading of prose, poetry, and drama. Through literary analysis the author's meaning is understood and, by means of oral reading skills, communicated to an audience.

SPC 1115 Introduction to Communication Skills**4 Q.H.**

This course is designed to give the student an opportunity to develop a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people. It examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

SPC 1116 Business and Professional Speaking**4 Q.H.**

The course focuses on practice of oral presentations, group communication, conference and discussion techniques, interview methods, and occasion speaking. The course combines performance aspects with case study methods of communication on the professional level.

SPC 1210 Advanced Vocal Techniques**4 Q.H.**

(Prereq. SPC 1110 or permission of instructor)

Development and application of vocal techniques acquired in SPC 1110. Emphasis on vocal analysis, flexibility, and regional patterns of speech.

SPC 1211 Advanced Oral Interpretation**4 Q.H.**

(Prereq. SPC 1111)

Opportunity to develop further oral reading skills acquired in SPC 1111. In addition, the course includes work with accents and dialects, study of reader's theatre, and an investigation of classical and modern philosophies of the art.

SPC 1232 Female/Male Communication**4 Q.H.**

The course surveys the various dimensions of female-male relations as they are created, sustained, or disintegrated through communication transactions. Emphasis will be on the various images and stereotypes of male and female sexual identity as they affect and are affected by communication in the development of hostility, friendship, or intimacy. Temporary, permanent, and destructive female-male relations will be examined as they lead to alternate lifestyles.

SPC 1239 Argumentation and Debate**4 Q.H.**

An applied course designed to help develop skills in rational decision making through advocacy. Attention is given to logical reasoning, psychological methods, and motivational techniques.

SPC 1250 Introduction to Mass Communication**4 Q.H.**

This is an introductory course designed to explore the many media through which people express themselves: radio, television, film, print, music. Attention is paid to the role of the individual as a media consumer.

SPC 1300 Introduction to Communication Theory**4 Q.H.**

This course is designed to offer basic knowledge and understanding of the processes involved in the transference of meanings. From the problems involved in defining communication, through a discussion of the nature of communication, various models of communication are examined. The nature of theory and

requirements of adequate theory are discussed, leading to an examination of various theories of human communication, including psychological, sociological, information, and system theories.

SPC 1310 Rhetorical Theory I**4 Q.H.**

(Prereq. SPC 1115, SPC 1250)

This course examines various theories of rhetoric, starting with the early Greeks (Plato's "Phaedrus" and "Gorgias," Aristotle's "The Rhetoric"), progressing through the rhetoric of Rome (Cicero's "de Brute" and Quintilian's "de Institutione"), and moving into a brief synopsis of medieval rhetoricians (Peter Ramus, Thomas Wilson, Thomas de Quincey, Francis Bacon, George Campbell, Richard Whately). The focus will be the student's growing knowledge and appreciation of the history and principles of rhetoric, which is the foundation of oral discourse.

SPC 1315 Theories of Persuasion**4 Q.H.**

The course surveys theoretical and conceptual approaches and research pertaining to the effectiveness of communication that is intended deliberately to induce changes in attitudes, beliefs, values, and/or behavior.

SPC 1317 Theories of Audience Behavior**4 Q.H.**

Surveying theoretical models, concepts, and research, the course focuses on the role of the receiver as an active participant in the communication process. Topics include individual information processing; listening as a learned behavior; intra-audience effects; relations between media and audience characteristics; dissemination, rumors, and information; and the development of societal norms and mores.

SPC 1318 Negotiation Skills**4 Q.H.**

(Prereq. Middler standing or higher, or permission of instructor)

The skills involved in bringing matters to mutually acceptable settlements will be investigated and applied through lectures, discussions, and especially through performance in case studies and role-playing simulations. Classroom activities will include such personal, professional, and governmental processes as conflict resolution, problem solving, and advocacy. Particular emphasis will be placed on the collective bargaining process in the private and public sectors, including negotiation, mediation, and arbitration.

SPC 1330 Interpersonal Communication I**4 Q.H.**

This is a conceptual, theoretical course designed to help increase awareness of the communication process. The course provides an examination of the ways in which we relate to other individuals and factors that influence these processes.

SPC 1331 Interpersonal Communication II**4 Q.H.**

(Prereq. SPC 1330 or permission of instructor)

The course focuses on application of concepts developed in interpersonal Communication I. It is an experiential course, exploring ways of becoming more aware of one's self and one's relationships with others and offering an examination of various options for communicating and increasing knowledge of the group process. Enrollment limited.

SPC 1338 Group Discussion**4 Q.H.**

Working in task groups, students are expected to explore theory and research in the area of group dynamics and to apply their knowledge to the classroom experience as they work on developing skills in decision making, problem solving, membership, and leadership.

SPC 1410 Contemporary Public Address**4 Q.H.**

The course offers a critical study of the public address of leading contemporary speakers representative of important political and social movements. This course seeks to help the student gain an appreciation of the dimensions and varieties of contemporary public address, broadly defined as symbolic discourse. From an understanding of various theories and approaches to public address, rhetorical situations are examined; the use of agitative and control strategies to accomplish social change is critically evaluated.

SPC 1415 Persuasive Techniques**4 Q.H.**

(Prereq. SPC 1315 or permission of instructor)

The course offers a critical, in-depth analysis of instances of persuasion as they occur in social interaction, social movements, politics, and advertising; identification of practical strategies employed; and the factors that influence the effectiveness of those strategies when persuaders attempt to influence others.

SPC 1430 Organizational Communication**4 Q.H.**

(Prereq. SPC 1250)

Organizational Communication examines the nature of communication in the context of complex organizations. The student will explore both internal and external organizational communication. Analysis of organizational communication will include: (a) communication networks, (b) communication technologies, (c) interpersonal communication modes, and (d) organizational interdependencies and their effect on information transfer and diffusion. Will include a section on organizational communication assessment and communication program implementation.

SPC 1437 Consultation Skills**4 Q.H.**

(Prereq. SPC 1300, SPC 1115, SPC 1330, and SPC 1338)

The course gives students the opportunity to acquire the skills necessary for analyzing communication difficulties in industry, organizations, and groups. Includes theory discussion, practice, and feedback, using case study method.

SPC 1450 Television I**4 Q.H.**

(Prereq. SPC 1250 or permission of instructor)

The course introduces the student to the equipment of a broadcast studio, surveys broadcast production techniques, and provides opportunities in class for applied practice through the production of programing suitable for broadcast.

SPC 1452 Radio I**4 Q.H.**

(Prereq. Permission of instructor)

The course centers around the role of the producer/director in the creation, preproduction planning, and

execution of local and network radio programs. Emphasis is on live broadcasts and live assembly of partially prerecorded programs. A great deal of time will be spent on the written materials necessary for program planning. The class will spend some time in the studio working on model program production and, possibly, actual live music performance broadcasts.

SPC 1500 Special Topics in Speech**Communication****4 Q.H.**

(Prereq. Permission of instructor)

The course provides an in-depth examination of a subject of particular significance to the field.

SPC 1554 Special Topics in Broadcasting**4 Q.H.**

(Prereq. SPC 1250 or permission of instructor)

This course introduces the student to the variety of roles played by broadcast professionals and to the interplay of professional functions integral to the broadcast industry. The focus is on a different aspect of the broadcast industry each term.

SPC 1600 Introduction to Communication**Research****4 Q.H.**

(Prereq. SPC 1300 or permission of instructor)

The course provides an introduction to scientific method and epistemology as it applies to the investigation of communication phenomena. The course is structured to assist students in finding and critically evaluating literature dealing with factors that influence the effectiveness of communication and that may be pertinent to either academic projects or managerial decision making.

SPC 1610 Rhetorical Criticism**4 Q.H.**

(Prereq. SPC 1310)

This course focuses on the principles of rhetorical analysis: theories, methods, and the application of these to discourses. Various types of discourse will be studied throughout the quarter. Attention will be given to understanding various methods and problems in rhetorical analysis. Judgment criteria, as well as the role of rhetorical criticism in society, will be examined.

SPC 1890; SPC 1891 Directed Study**(each) 4 Q.H.****SPC 1892 Directed Study****4 Q.H.****SPC 1895 Internship in Speech Communication****4 Q.H.**

This course provides a student with the opportunity to gain academic credit for on-the-job training in an allied career field. Enrollment requires prior approval by a department committee, demonstration that the job allows opportunities to apply theoretical understanding to specific application in the work environment, and faculty advisement as well as on-the-job supervision.

SPC 1896 Internship in Speech Communication**4 Q.H.**

See SPC 1985.

Theatre and Dance

Roman numerals at the end of course descriptions refer to *Core Curriculum* categories listed on pages 1-2.

DRA 1100 Introduction to Theatre Arts 4 Q.H.

The course provides a brief view of the historical development of acting, directing, and production design. Emphasis is on appreciation of contemporary theatrical forms.

DRA 1106 Theatre History I 4 Q.H.

(This course is the first in a three-course sequence, although each course is self-contained and may be taken independently.) The history of world theatre and drama, including an examination of the characteristics of the drama and the nature of theatrical performance during each period, as well as the social and artistic contexts in which performance occurred. The periods examined this term are ancient Greece and Rome, medieval Europe, Elizabethan and Stuart England.

DRA 1107 Theatre History II 4 Q.H.

(This course is the second in a three-course sequence, although each course is self-contained and may be taken independently.) A continuation of Theatre History I. The periods examined this term are the Spanish Golden Age, the Italian renaissance, the theatre of baroque and eighteenth-century Europe, the rise of romanticism and realism in European theatre, and the theatre of Asia from its beginnings.

DRA 1108 Theatre History III 4 Q.H.

(This source is the third in a three-course sequence, although each course is self-contained and may be taken independently.) A continuation of Theatre History II. The course examines the rise of naturalism in the European theatre, the development of theatre in the United States, and the rise and development of modernism and post-modernism in America and European theatre.

DRA 1112 Drama Theory/Criticism 4 Q.H.

An examination of both the major historical statements of drama theory and contemporary drama criticism as evidenced in journalistic play reviews. Students are required to prepare reviews of local productions.

DRA 1116 The American Theatre 4 Q.H.

The course focuses on the American theatre from the Revolutionary War to the present.

DRA 1117 The Theatre of Williams, Miller, and Albee 4 Q.H.

The course offers an intensive study of the works of three major post-World War II American playwrights.

DRA 1118 Black Theatre in America 4 Q.H.

The course surveys the history of black theatre artists in America from the time of Ira Aldridge to the present day. Also examines the works of black playwrights from the Harlem Renaissance to the present, with an emphasis on the period beginning with Baraka's "Dutchman."

DRA 1120 The Restoration Theatre 4 Q.H.

The philosophical, social, historical, and critical influences upon the Restoration theatre and its dramatists.

DRA 1121 Contemporary Theatre 4 Q.H.

The course examines the various forces that have shaped the major trends in Western theatre over the past two decades. The course includes a study and examination of contemporary theatre concerns covering topics such as women's rights, politics, race, nudity, and homosexuality, as presented in theatres or performed by experimental and avant-garde groups.

DRA 1122 Twentieth-Century European Theatre 4 Q.H.

An examination of major twentieth-century European attempts to break away from the nineteenth-century realistic tradition. Representative works of expressionistic, symbolistic, epic, and absurd theatre artists will be examined.

DRA 1123 The Theatre of Ibsen, Strindberg, and Chekhov 4 Q.H.

Intensive study of the theatre of the three great masters of the naturalistic movement in Europe whose works stand as the foundation of modern drama.

DRA 1124 The Irish Theatre 4 Q.H.

The course focuses on theatre and drama in Ireland from their beginnings to the present, with the backgrounds of Irish folklore and history. Particular emphasis on developments in the twentieth century.

DRA 1125 The Theatre of the Absurd 4 Q.H.

The course focuses on the theatre of the absurd as an anti-literary reflection of and reaction to life; its effects upon Western drama. Major concern with selected works and ideas of Jarry, Artaud, Camus, Sartre, Beckett, Genet, Ionesco, Pinter, Kopit, Brown, and Arrabal.

DRA 1127 The Comic Theatre 4 Q.H.

The course focuses on the comic theatre from its beginnings in the ancient Greek theatre to its performances in contemporary theatre; an examination of the comic playwright, the comic actor, the comic director—the synthesizing of the arts of the theatre to produce thoughtful as well as titillating laughter. Included are study of scripts by such playwrights as Aristophanes, Molière, Shaw, Neil Simon; techniques of Charlie Chaplin, the Marx Brothers, stand-up comics. Directional devices will be examined through lecture, film, records, and attendance at live performances.

DRA 1130 Eastern European Theatre and Drama 4 Q.H.

A survey of the history of theatre and drama in Russia and Poland from the nineteenth century to the present. Emphasis will be placed upon the contributions of Polish romanticism, developments in the Soviet theatre

of the 1920s, and on the work of major Polish and Russian dramatists and theatre artists who have influenced Western theatre profoundly. (Course taught in English.)

DRA 1140 Playwriting I **4 Q.H.**

The principles and practices of modern dramatic composition: characterization, plot, plot structure, dialogue, and other dramaturgical elements as seen in the one-act play. Included are the writing of brief scenes, the dramatic composition, and the one-act play.

DRA 1150 Introduction to Acting **4 Q.H.**

Fundamental techniques of stage use. The actor and the stage environment. Improvisations for strengthening imagination and increasing freedom. Analysis of scripts for work on performed scenes.

DRA 1155 Speech for the Theatre **4 Q.H.**

The course focuses on vocal technique and speech problems unique to actors performing in classical and contemporary theatre.

DRA 1160 Body Movement I **4 Q.H.**

(Prereq. Theatre major or permission of instructor) Students begin with simple Esalen physical awareness exercises, explore the warm-up process, and then try to find which exercises serve them best. Simple theatre games (i.e., machines, transformations, activity improvisations) are introduced, and students have the opportunity to learn how to relax through concentration on a specific mental task.

DRA 1180 Concepts of Direction **4 Q.H.**

(Prereq. DRA 1150 and DRA 1212)

Theories of dramatic presentation through analysis of selected historical developments. Purposes and techniques of theatrical direction as they relate to script analysis, production style, pictorial composition, rhythmic evolution, and empathic responses.

DRA 1200 Stagecraft **4 Q.H.**

Principles that underlie the coordination and execution of technical production; examination of different kinds of scenery, tools, equipment, construction materials, and lighting techniques. Laboratory work: preparing technical elements of University productions.

DRA 1209 Theatrical Drafting **4 Q.H.**

(Prereq. DRA 1200)

By working on supervised classroom projects, the student is exposed to the basic graphic language needed to translate a designer's ideas into technical drawings used for construction. These basic skills can be used for future course work in design, University productions, and professional work.

DRA 1210 Scenic Design for the Stage **4 Q.H.**

(Prereq. DRA 1200, DRA 1212 or permission of instructor)

An introduction to the theory and practice of theatrical design and the role of the designer in the production process. Project work examines the use of the graphic tools—line, form, balance, colour, rhythm,

etc.—in the development of the design idea. Emphasis is based on understanding and utilizing spatial relationships; visually expressing conceptual themes; and understanding the various uses, problems, and practical considerations of proscenium, thrust, and arena staging. Historical analysis covers production styles from the Greco-Roman period through the nineteenth century.

DRA 1212 Introduction to Theatrical Design

4 Q.H.

An introduction to the visual effects of modern theatrical production and the creative processes by which these come into being, through a basic survey of the three major design disciplines, their supporting technology, and their working interrelationship. The questions of how artistic concepts are developed and related, how they are communicated to other artists and an audience, and how one develops the critical processes necessary to evaluate these concepts will be addressed by the design faculty as applicable to their respective areas of expertise.

DRA 1213 Scene Design II: Principles **4 Q.H.**

(Prereq. DRA 1210)

The development and expression of conceptual statements from specific dramatic texts through a series of exercises involving script analysis and introductory work in rendering and model construction. Texts to be examined are selected from works of distinct historical and stylistic periods. The heritage of twentieth-century theatrical design will be studied through the work of artists such as Appia, Craig, Jones, Urban, and Oenslager. Emphasis is placed on the development of such stylistic treatments as realism, expressionism, symbolism, and constructivist and environmental design.

DRA 1214 Scene Design III: Techniques **4 Q.H.**

(Prereq. DRA 1213)

Advanced work focusing on the practical application of the theories, materials, and techniques of contemporary design. Emphasis is placed on furthering the student's ability to research a project as well as executing perspective drawings, renderings, and painter's elevations. Assignments in critical analysis are based on various contemporary American and European production of dramatic and operatic works. The work of such influential designers as Aronson, Bay, Mielziner, and Svoboda will be discussed as will the contributions of such nontheatre artists as Chagall, Dali, and Picasso.

DRA 1225 Scene Painting **4 Q.H.**

(Prereq. DRA 1200 or permission of instructor)

The history of scene painting and ornament from classical to contemporary times. Studio organization, color, color theory, equipment, tools, materials, and costs involved with painting stage scenery. Projects and exercises in the use of different media, matching colors, painting of textures, light and shade, and the use of stencils and physical textures. Laboratory sessions include painting stage scenery for University productions.

DRA 1226 Lighting Design for the Stage 4 Q.H.

(Prereq. DRA 1200, DRA 1212 or permission)

Basic principles and practices of stage lighting, including the qualities and functions of light, lighting instruments and controls, basic electricity, color in light, and analysis of the script in terms of light requirements. Students are expected to develop light plots and schedules for various kinds of stage productions. Classwork includes laboratory work on lighting crews for University productions.

DRA 1246 Sound for the Theatre 4 Q.H.

Beginning with a basic introduction to both natural and electronically produced sound, the course will go on to discuss the component parts of sound systems, their theories and applications. Techniques of recording and editing will be discussed and demonstrated with particular reference to the creation of sound tracks and effects for theatrical productions. The concepts of sound reinforcement systems for musicals, concerts, and other current professional applications will be investigated.

DRA 1261 Costuming I 4 Q.H.

(Prereq. DRA 1212 or permission)

The course presents the beginning designer with the opportunity to investigate costume design theory and to foster perceptual development. Through lectures and projects, the student will have the opportunity to explore both the abstract and historical aspects of costume design as well as textual analysis and its conceptual implications. Prior art or design education is not necessary.

DRA 1265 Pattern Drafting and Costume Construction 4 Q.H.

The course will develop the skills and techniques necessary for the patterning, cutting, and construction of costumes for the stage. Flat pattern drafting, draping, and finishing techniques will be covered.

DRA 1280 Stage Makeup 4 Q.H.

The principles of, the reasons for, and the materials used in makeup for the theatre, television, and films. The practical application of types and styles of makeup—straight, old-age, character, and corrective—is also included.

DRA 1284 Theatre Management 4 Q.H.

Theatre management, including problems of financing, promoting, and programming for educational, community, profit, and nonprofit professional theatre.

DRA 1292 Children's Theatre 4 Q.H.

Theories and methods of creative techniques related to children's programs in schools, churches, and recreational facilities. Analysis of literature in preparation for production of children's plays.

DRA 1300 Acting II 4 Q.H.

(Prereq. DRA 1150)

Fundamental analysis of the script, including physicalizations and vocal scoring; character analysis; scenes performed for classroom analysis.

DRA 1301 Acting III 4 Q.H.

(Prereq. DRA 1300)

Further development of the actor's tools, script and character scoring, exercises for physical and psychological freedom. In-class scenes from works in progress are included.

DRA 1302 Acting IV 4 Q.H.

(Prereq. DRA 1301)

This course deals with the specific demands which verse plays place on actors. By working on scenes, textual analysis of individual speeches, and reading relevant criticism, students will become familiar with different aspects of text analysis and the problems inherent in acting verse. One paper will be required. The course will concentrate on the works of Molière and Shakespeare.

DRA 1350 Problems in Direction 4 Q.H.

(Prereq. DRA 1180)

Experimentation in theory related to the staging of classical and modern drama. Analysis of plays in actual production: casting, rehearsals, character interpretations. Each student is responsible for the production of a one-act play.

DRA 1370 Rehearsal and Performance 4 Q.H.

(Prereq. Permission of instructor)

Oriented to allow the students to participate in public performance through preparation and rehearsals in areas of acting, directing, design, and stagemanaging.

DRA 1400 Costuming II 4 Q.H.

(Prereq. DRA 1261 or permission of instructor)

Advanced study in textual interpretation and its application to costume design. Conceptual and stylistic development will be emphasized through assigned projects in the various genres of the performing arts.

DRA 1410 Technical Production 4 Q.H.

(Since this course will be the culmination of the design student's background and experiences, the student must already have completed all courses stipulated in his/her chosen design concentration before taking this particular course.)

An advanced course which allows the student the opportunity to further explore his or her capabilities through the practical application of acquired technical and aesthetic skills in an area related to the student's desired specialization. Focusing on one substantial production or project responsibility, this specialized study will be designed and executed in close supervision with the faculty member responsible for the area of concentration.

DRA 1420 Advanced Drafting and Construction 4 Q.H.*

(Prereq. DRA 1209)

A specialized course in technical production techniques. Drafting procedures necessary for the conversion of designer's drawings into detailed rear elevation and construction layouts will be covered, as well as the development of section, isometric, and

* Lab fee required.

oblique views. Through a series of practical and project exercises, the various factors governing the construction and rigging of two- and three-dimensional scenery, linear-motion, rotary-motion, and elevating systems will be analyzed. Emphasis is placed on theatrical problem solving with regard to safety, dependability, and economy.

DRA 1430 Lighting Design II **4 Q.H.**
(Prereq. DRA 1226)

An intensive course in lighting design theory and practice. Students are expected to design numerous lighting plots, sections, instrument schedules, and design concepts, for various types of productions and spaces. Current professional techniques and practices will be investigated and discussed.

DRA 1500 Playwriting II **4 Q.H.**
(Prereq. DRA 1140)

Continuation of DRA 1140.

DRA 1800, DRA 1801, DRA 1802, DRA 1803
Practicum in Production **(each) 1 Q.H.**

(Prereq. departmental permission)

Laboratory practice in technical production. To be repeated for credit (maximum four credits).

DRA 1810, DRA 1811, DRA 1812, DRA 1813
Junior-Senior Honors Program **(each) 4 Q.H.**

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 1.

DRA 1820, DRA 1821, DRA 1822, DRA 1823
Directed Study **(each) 4 Q.H.**

DRA 1840, DRA 1841, DRA 1842, DRA 1843,
DRA 1844, DRA 1845, DRA 1846, DRA 1847,
DRA 1848, DRA 1849 Special Topics in Theatre/
Dance Performance **(each) 4 Q.H.**

An in-depth examination of a subject of particular significance to the field.

DRA 1860, DRA 1861, DRA 1862, DRA 1863,
DRA 1864, DRA 1865, DRA 1866, DRA 1867
Special Topics in Theatrical Design

(each) 4 Q.H.

An in-depth examination of a subject of particular significance to the field.

DRA 1890, DRA 1891, DRA 1892, DRA 1893
Special Topics in Theatre History/Dramatic Criticism

(each) 4 Q.H.

An in-depth examination of a subject of particular significance to the field.

INT 1100 Introduction to Art, Drama, and Music
4 Q.H.

This interdisciplinary course offers an integrated approach to three related disciplines: art, drama, and music. Basic vocabulary and analytical techniques are established for each discipline, emphasizing such common elements as color, line, rhythm, texture, and form. Representative works from various periods are examined in the context of the cultures that produced them, and lectures focus on parallels and contrasts among the three disciplines' manifestations of specific trends, principles, and ideals. Lectures, readings, and listening assignments are supplemented by visits to art galleries and attendance of concerts and theatrical performances. (II)

INT 1110 American Musical Theatre **4 Q.H.**

This course traces the development of the American musical from works such as "The Black Crook" to the present. The role of musical theatre, both as entertainment and as serious art form, is considered through an examination of script, score, dance, and design. Works by composers and lyricists such as Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter are studied.

Accounting

ACC 1111 Accounting Principles I **4 Q.H.**

This first of a series of accounting courses assumes students do not possess knowledge of the subject. Both this course and ACC 1112 are designed to help provide an understanding of accounting issues and objectives for proper interpretation and analysis of financial data. Specific topics covered in this first course are: 1) the nature, function, and environment of accounting; 2) the basic accounting model; 3) financial and analytical ratios; 4) the accounting cycle; 5) accounting for merchandising entities; and 6) the control of cash and receivables.

ACC 1112 Accounting Principles II **4 Q.H.**
(Prereq. ACC 1111)

The second of a series of accounting courses. Students are introduced to financial and managerial accounting decisions through class discussions, short exercises, and demonstration problems. Specific

topics covered include: 1) control of inventory; 2) acquisition, depreciation, and disposal of plant and equipment; 3) paid-in capital related to sole proprietorships, partnerships, and corporations; 4) short- and long-term debt financing; 5) the analysis and interpretation of financial reporting; and 6) the statement of changes in financial position.

ACC 1210 Introduction to Accounting for the
Non-Business Major **4 Q.H.**

(Not open to College of Business Administration students)

Specifically for non-business majors, this course is designed to help provide a fundamental knowledge of accounting to students who do not expect to become accountants but would like the opportunity to learn to understand, interpret, and make use of accounting data. The course surveys the foundations of accounting and the role it plays in the management

of the profit and nonprofit sectors of the American economy.

ACC 1330 Cost Accounting for Management

(Prereq. ACC 1112) **4 Q.H.**

This course offers an examination of cost accounting from a managerial viewpoint. The impact of quantitative and behavioral aspects on budgets and cost control is stressed. This course is designed specifically for management majors.

ACC 1331 Intermediate Accounting I **4 Q.H.**

(Prereq. ACC 1112 or equiv.)

The principal foundation course for accountants begins with a comprehensive review of basic accounting principles, operations, and financial statements. Development of accounting theory is stressed in the analysis of alternative treatments and procedures. Specific areas receiving intensive treatment are cash, accounts receivable, inventories, and current liabilities.

ACC 1332 Intermediate Accounting II **4 Q.H.**

(Prereq. ACC 1331)

This course is a continuation of the study of accounting principles, concepts, and procedures. Specific topics emphasized are long-term assets, depreciation, stockholders equity, and EPS.

ACC 1339 Cost Accounting I **4 Q.H.**

(Prereq. ACC 1112)

This course examines cost determination and use. Special consideration is given to manufacturing concerns. Specific coverage includes cost behavior, relevant costs, performance evaluation, budgets, and standard costs.

ACC 1340 Cost Accounting II **4 Q.H.**

(Prereq. ACC 1339)

This course is a continuation of ACC 1339 (Cost Accounting I) and gives special attention to the use of cost data in decision making, budget planning, and the control process.

ACC 1343 Intermediate Accounting III **4 Q.H.**

(Prereq. ACC 1332)

This course completes the study of basic accounting concepts and covers special areas of concern to modern accounting practice. Leases, pensions, accounting changes, income tax accounting, changes in financial position, price-level and current-value accounting are studied.

ACC 1348 Accounting Theory and Practice

(Prereq. ACC 1343) **4 Q.H.**

Objectives are to examine: 1) the theory and practice of corporate financial reporting and some of the controversial areas in accounting; 2) the pronouncements and research studies of the authoritative institutions of the profession relating to the practice of accounting; 3) the textual and periodical literature on accounting theory.

ACC 1349 Accounting Planning and Control

(Prereq. ACC 1340) **4 Q.H.**

This course provides an examination of the role of

management planning and control systems and problems inherent in their design and use, and defines the process of identifying factors in the design of these systems.

ACC 1501 Auditing

4 Q.H.

(Prereq. ACC 1343)

Designed for the student who plans to enter the public accounting profession, this course examines audit concepts, standards, and procedures, including the auditor's legal and ethical responsibilities. Emphasis is on concepts rather than procedures. Specific areas covered are auditing standards, auditor's reports, internal control, statistical sampling, EDP, and legal liability.

ACC 1505 Internal Auditing

4 Q.H.

(Prereq. Middler standing)

This course is designed to aid students in understanding how the internal auditor undertakes a review and appraisal of operations. Study will focus on the internal audit environment, preparation of long-range programs, the performance of preliminary surveys, flowcharting, the development of audit programs, sampling, audit techniques, and reporting. The course is case-study oriented.

ACC 1511 Federal Income Taxes I

4 Q.H.

(Prereq. ACC 1343 or permission of instructor)

This course stresses basic understanding of the federal income tax structure relating to individuals rather than to corporations. Students are required to complete several research cases directed at solving various tax problems. Case studies introduce the student to the current Internal Revenue Code, income tax regulations, and cumulative bulletins. Tax court cases and various private company publications are discussed.

ACC 1512 Federal Income Taxes II

4 Q.H.

(Prereq. ACC 1511)

This course is a continuation of ACC 1511 (Federal Income Taxes I), focusing on taxpayers other than individuals and the treatment of those property transfers subject to federal, gift, estate, and trust taxes. Tax research is an important element of this course. A major emphasis is given to tax planning considerations, especially to gift and death tax consequences.

ACC 1521 Advanced Accounting Problems

(Prereq. ACC 1343)

4 Q.H.

This course is an in-depth analysis of various accounting topics for the student planning a career as a professional accountant. Topics covered are government and not-for-profit accounting; partnerships; installment sales; consignments; segment and interim reporting; foreign currency accounting; troubled-debt restructurings; and liquidations, estates, and trusts.

ACC 1522 Advanced Accounting for Business Combinations

4 Q.H.

(Prereq. ACC 1343 or permission of instructor)

This course is a comprehensive analysis of the accounting theory and practice associated with corporate acquisitions and combinations. Topics include

methods of consolidation-elimination of profits on intercompany transactions, purchase versus pooling of interests, and accounting for good will. The course is intended for the serious student preparing for a career as a professional accountant.

ACC 1526 Management Accounting 4 Q.H.
(Prereq. ACC 1349)

This course examines the role of the management accountant. Topics include relation between financial and managerial accounting, design and use of accounting and control systems, measurement techniques and uses, the role of behavior in accounting, performance evaluation, and other topics of current interest.

ACC 1530 Accounting Systems 4 Q.H.
(Prereq. Middler standing)

This course examines the process of designing both financial and managerial accounting systems. The approach is conceptual, and the course considers the use of computer technology in designing new systems where computers are appropriate. The course assumes an understanding of accounting processes in both financial and managerial areas.

ACC 1531 Contemporary Accounting Problems 4 Q.H.
(Prereq. ACC 1332)

A seminar designed to survey some of the important problem areas currently facing the accounting profession. These areas will incorporate asset valuation, price-level adjusted statements, environmental considerations, income measurement, and governmental intervention.

ACC 1535 Computers in Accounting and Auditing 4 Q.H.
(Prereq. ACC 1501 or ACC 1505)

This course examines the use of computers in ac-

counting and auditing. Topics include systems design and applications in accounting, internal control of computer-based systems, computer audit and control guidelines, and EDP audit tools and techniques.

ACC 1591 Independent Study 1 Q.H.

For the student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

ACC 1592 Independent Study 2 Q.H.
Same as ACC 1591

ACC 1593 Independent Study 3 Q.H.
Same as ACC 1591

ACC 1594, ACC 1595, ACC 1596, ACC 1597, Independent Study 4 Q.H.
Same as ACC 1591

ACC 1891 Honors Thesis in Progress 0 Q.H.

ACC 1892 Honors Thesis 8 Q.H.

ACC 1893 Honors Thesis in Progress 0 Q.H.

ACC 1894 Honors Thesis 12 Q.H.

Entrepreneurship

ENT 1330 Management of Smaller Enterprises 4 Q.H.

This is a general management course that focuses upon the strategies and operating problems of smaller, already established business enterprises. The course is designed for individuals who are considering entrepreneurial careers or careers in management, finance, or marketing within the smaller-company environment. Discussion will explore the characteristics and urgencies of problems that smaller companies are likely to encounter at different stages in their evolving life cycle, from the postnatal period to the more mature stage.

ENT 1344 Opportunity Analysis and Venture Capital 4 Q.H.

This course is concerned with the essential tasks performed prior to establishing a new venture. These include finding a suitable business opportunity or

developing an idea for a product or service; analyzing the feasibility of the opportunity or idea; developing a business plan; structuring the venture team; seeking sources of seed capital; and forming a venture action plan for beginning operations.

ENT 1352 New Venture Creation: A Career Choice 4 Q.H.
(Prereq. Senior standing)

This course is designed to assist students interested in small business in answering a number of important questions through a systematic analysis of their own potentials for entrepreneurial careers: What is involved in starting my own business? What is my own entrepreneurial orientation and commitment? What managerial and behavioral skills do I need for achievement? How can I plan for my personal and entrepreneurial goals? Case discussions, self-assessment, goal-setting exercises, guest speakers, and a student-selected project are used.

ENT 1358 Small Business Institute Project

8 Q.H.

(Prereq. Junior standing; one entrepreneurship course or permission of instructor)

The Small Business Institute Field Project was brought into existence with the cooperation of the Small Business Administration (SBA) and some of its client companies in Greater Boston. A student team is expected to interact with a smaller company, helping management to analyze opportunities and problems facing the business, and to develop practical recommendations for the company's decision makers. Students are expected to allocate approximately one day per week to the project, including on-site work with the company owner-managers with whom they have been paired and to participate in related research, report preparation, and presentation of results. This real-world experience is blended with occasional class meetings and frequent team meetings with a faculty member to discuss the field work and to explore alternatives. Interim progress reports and a final report are presented to the client company, SBA, and the class.

ENT 1591 Independent Study

1 Q.H.

For the student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to

the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

ENT 1592 Independent Study

2 Q.H.

Same as ENT 1591

ENT 1593 Independent Study

3 Q.H.

Same as ENT 1591

ENT 1594, ENT 1595, ENT 1596, ENT 1597 Independent Study

4 Q.H.

Same as ENT 1591

ENT 1598 Independent Study

8 Q.H.

Same as ENT 1591

ENT 1812 Honors: Risks and Rewards of Entrepreneurship

4 Q.H.

(Prereq. Honors participants or permission of instructor)

Anxiety and exhilaration run neck and neck through the small business experience. The degree to which these extremes of emotion occur has not been thoroughly studied. So far, research has concentrated on the backgrounds and attributes of entrepreneurs rather than on the psychological and physiological "fallout" from running their companies. The purpose of this honors seminar will be to identify situations and issues that can cause entrepreneurs stress, on the one hand, and satisfaction, on the other.

ENT 1891 Honors Thesis in Progress

0 Q.H.

ENT 1892 Honors Thesis

8 Q.H.

ENT 1893 Honors Thesis in Progress

0 Q.H.

ENT 1894 Honors Thesis

12 Q.H.

Finance and Insurance

FIN 1201 Personal Finance

4 Q.H.

(Not open to College of Business Administration students)

The course focuses on management of the total personal estate: budgeting, savings, insurance, investments, borrowing, taxes, Social Security, pensions, annuities, securities markets, mutual funds, and their integration.

FIN 1333 Financial Institutions and Markets **4 Q.H.**
(Prereq. Middler standing)

The course aims to provide students an understanding of the financial environment faced by a firm as well as the financial institutions serving the economy. The course discusses the forces that determine the changes in money and capital markets and explores the implications of changing financial environment for the management of funds in a firm and/or financial institution.

FIN 1335 Managerial Finance

4 Q.H.

(Prereq. FIN 1438)

The objective of the course is to provide students the opportunity to gain knowledge of the advanced tools and concepts used in the management of funds. Topics include inventory and credit policies, risk, capital budgeting, financial structure, cost of capital, dividend policy, and valuation of a firm. Overall financial strategy and timing of its implementation are also examined. Specialized topics—mergers and acquisitions, financial failure, and financial policy for multinational firms—may be considered in the course.

FIN 1346 Investment Management

4 Q.H.

(Prereq. FIN 1438 and MSC 1201)

This course offers a broad overview of the concepts, practices, and procedures of investment management. Areas covered include basic security types, security market operations, security analysis (both fundamental and technical) and an introduction to portfolio management.

FIN 1438 Introduction to Finance 4 Q.H.

(Prereq. ACC 1112 and middler standing)

The objective of this course is to acquaint students with basic processes, principles, tools, and concepts of finance. Topics include financial analysis, financial forecasting, profit planning, budgeting, working capital management, and capital budgeting. The course also covers the basics of financial markets, institutions, and sources of supply of different types of funds available to a firm.

FIN 1503 Taxes and Financial Decisions 4 Q.H.

(Prereq. ECN 1105 and middler standing)

In this course, the case method is used to discuss a number of financial decisions that are greatly influenced by tax considerations, the most important of which are concerned with capital structure, dividend policy, acquisition terms, investment policies and liquidations. The federal income tax receives primary consideration, but state and foreign taxes are also discussed.

FIN 1520 Speculative Markets 4 Q.H.

(Prereq. FIN 1346)

The purpose of this overview course is to familiarize the student with all aspects of speculative markets, including options, futures, and options on futures.

FIN 1522 Seminar in Option Markets 4 Q.H.

(Prereq. FIN 1520 and FIN 1333)

While puts and calls have been traded for many years, a market for listed options only appeared in 1973. Trading options on exchanges made such activity much easier and opened many more opportunities for both speculation and the protection of security positions. The purpose of this seminar is to explain the basic mechanics of this market, the characteristics of puts and calls, the techniques that may be applied, and current developments in the field. Students will be required to do individual research related to current methodology and concepts. Some knowledge of money and capital markets, as well as corporate finance, is necessary for those taking the course.

FIN 1525 Seminar in Financial Futures 4 Q.H.

(Prereq. FIN 1520)

This is a seminar in commodity futures markets centered in the area of financial futures, with special emphasis on interest rate futures. The course covers the methods of trading, margins, hedging, spreading futures contracts in treasury bills, commercial paper, treasury bonds, treasury notes, GNMA's, etc. Students prepare a seminar report on some aspect of the futures market.

FIN 1526 Securities Markets 4 Q.H.

(Prereq. FIN 1438)

This course aims to analyze the operation of the securities market. Striking a balance between descriptions and analysis, the course provides students the opportunity to examine in detail the operation and function of investment bankers, broker-dealers, and securities exchanges. There is a thorough study of the mechanics of cash and margin accounts, trading options, and regulations affecting securities markets.

FIN 1528 Seminar in Finance Theory 4 Q.H.

(Prereq. FIN 1335)

The course involves a discussion of the different theories related to the financial policies of business organizations and an analysis of the contributions of various theorists in finance. It covers topics such as debt capacity, capital budgeting under uncertainty, cost of capital, dividend policy, and the capital asset pricing model. The policy implications, limitations, and underlying assumptions of various theories are incorporated into the course.

FIN 1530 Working Capital Management 4 Q.H.

This course examines strategies and analytical approaches to managing current assets and current liabilities. It explores corporate cash management under changing money market conditions and discusses the use of interest rate futures and working capital management in a multinational context.

FIN 1531 Long-term Financial Management 4 Q.H.

(Prereq. FIN 1438 and FIN 1385)

This course focuses on several phases of long-term finance. Particular attention is devoted to complex cases dealing with capital budgeting, new financing, and mechanisms (both public and private) used to raise long-term funds.

FIN 1540 Management of Financial Institutions

(Prereq. FIN 1438 and FIN 1333)

4 Q.H.

This course offers a broad study of the decision-making problems faced by financial institutions such as commercial banks, savings and investment institutions, and finance companies when viewed as competitive, profit-seeking business entities. Topics include the nature and scope of the capital markets confronting institutions, specialized problems regarding the sources and uses of funds of financial institutions, the nature of competition, the regulation of financial institutions, and strategic policy planning of financial institutions.

FIN 1543 Modern Portfolio Management 4 Q.H.

(Prereq. FIN 1335 and FIN 1346)

This course seeks to analyze the methods of selection, revision, and performance measurement of asset portfolios. The student will be exposed to the current and most modern methods of asset portfolio-building in business today. The concept of the efficient frontier of assets in the risk-return space will be presented and evaluated. Included in the course is a simulated equity fund management project. Each student must initially select a number of equity securities to satisfy the stated objectives of his/her fund and at the end of the course will be required to prepare and present an annual report evaluating the portfolio's construction and performance.

FIN 1544 Bank Management 4 Q.H.

(Prereq. FIN 1438 and FIN 1333)

This course deals with the financial management of commercial banks and thrift institutions. The problems of liquidity and investment management, loan portfolio and capital management, and pricing problems associated with various sources and uses of

funds are analyzed in the context of changing economic and regulatory environment for these institutions. The course is conducted through lectures, discussions, and cases.

FIN 1550 Real Estate Finance: Analysis and Investment **4 Q.H.**

(Prereq. FIN 1438)

This course provides students with a comprehensive overview of real estate finance. Factors affecting real estate investment are emphasized. Specific topics covered include: valuation (appraisal) market analysis development, ownership types, short-term financing, mortgage markets, the impact of inflation on real estate investment, and finance and investment strategies. The course is designed for students interested in a general overview of real estate finance, as well as those intending to pursue further studies in real estate. Instruction is primarily through readings, lectures, and case discussions.

FIN 1552 Entrepreneurial Decision Making in Real Estate **4 Q.H.**

(Prereq. FIN 1550)

This course provides an overview of property acquisition, development, and management from an entrepreneurial perspective. Topics include planning, financing, cost control, and management of construction, marketing, and joint ventures. All major land uses are considered. Instruction is primarily through lectures and case discussions. Some class sessions may be devoted to guest speakers from the real estate community.

FIN 1562 A Risk Management Approach to Employee Benefit Programs **4 Q.H.**

(Prereq. FIN 1438)

The concept of risk management is employed to develop a framework for a systematic treatment of employee benefit programs. The risks associated with the employee are defined, methods used by an employer to handle these risks are reviewed, and the concept of cost minimization of employee benefit programs is introduced. Private insurance, Blue Cross/Blue Shield, and government programs are viewed as alternative financing mechanisms of employee benefit programs, and the benefits and costs of these institutional arrangements are discussed.

FIN 1566 A Risk Management Approach to Property and Casualty Insurance **4 Q.H.**

(Prereq. FIN 1438)

The concepts of risk, uncertainty, risk management, and insurance are introduced. A comprehensive analysis of property and casualty insurance markets and products is presented from a buyer's perspective. Principal emphasis is placed on defining and analyzing alternative methods of treating risk in a business enterprise. The course discusses different risk management strategies and analyzes practical situations.

FIN 1580 Personal Financial Management **4 Q.H.**

(Prereq. FIN 1438)

The course places emphasis on the development of

personal financial management expertise based on an integrated plan for personal choices in which alternative courses of action are judged by their contribution to the attainment of the decision maker's particular set of economic objectives. The overall personal economic plan is the consistent focus of the course and unites such diverse topics as inflation and investment selection, insurance, short- and long-run hedges against the purchasing power risk, purchasing assets, etc. The course is decision oriented and attempts to expose students to alternative courses of action and lead them toward a rational solution by developing techniques of estimating the success probabilities of alternative methods.

FIN 1591 Independent Study **1 Q.H.**

For the student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

FIN 1592 Independent Study **2 Q.H.**

Same as FIN 1591

FIN 1593 Independent Study **3 Q.H.**

Same as FIN 1591

FIN 1594, FIN 1595, FIN 1596, FIN 1597 Independent Study **4 Q.H.**

Same as FIN 1591

FIN 1760 International Financial Management **4 Q.H.**

(Prereq. FIN 1438)

This course introduces students to the international financial environment. Subjects include balance of payments, exchange rates, Eurocurrencies, foreign capital markets, etc. The financial policies and practices of companies involved in multinational operations are considered. Specific topics include capital budgeting; capitalization policies, the use of Eurocurrency and Eurobond markets, and foreign exchange risk management by the international firm.

FIN 1770 Small Business Finance **4 Q.H.**

(Prereq. FIN 1438)

This course utilizes the basic processes, principles, tools, and concepts of finance within the parameters of a small business to develop a complete financial plan that projects the future circular flow of funds by analyzing and then integrating the impact of both investment decisions (use of funds) and financial decisions (source of funds).

FIN 1803 Honors: Seminar in Finance Theory
(Prereq. Participant in Honors Program only) **4 Q.H.**
See Course Description for FIN 1528.

FIN 1804 The Application of the PC to Financial Management
(Prereq. Participant in Honors Program) **4 Q.H.**

This honors seminar in finance will offer an opportunity to explore the application of basic analytical programs to problems in corporate financial management by means of the personal computer. Students will be required to learn the major functions of Lotus 123 and to apply them to a variety of financial management problems, including basic financial analysis, financial forecasting of working capital needs, financial modeling, capital budgeting, and capital structure decisions.

FIN 1806 Investment Arbitrage **4 Q.H.**

(Prereq. Honors participant or permission of instructor)
The purpose of this course is to provide the student with an opportunity to develop the prerequisite skills necessary for conducting successful investment arbitrage. Incorporating the recent insights into arbitrage pricing theory, students will conduct an extensive computerized analysis of the arbitrage opportunities in the financial equity, debt, option, and futures markets. Examination of this emerging and popular investment approach will be augmented with the appearances of guest arbitrage practitioners.

FIN 1891 Honors Thesis in Progress **0 Q.H.**

FIN 1892 Honors Thesis **8 Q.H.**

FIN 1893 Honors Thesis in Progress **0 Q.H.**

FIN 1894 Honors Thesis **12 Q.H.**

Human Resources Management

HRM 1332 People and Productivity: Human Resources Management **4 Q.H.**
(Prereq. HRM 1432)

This course is designed to help students develop understanding of contemporary issues in human resource management. Problems posed by changing work patterns, labor force characteristics, union activities, and government policies are examined. Organizational experiments such as worker participation, job enlargement, and group incentives are discussed and evaluated from a managerial perspective.

HRM 1340 Personnel Administration **4 Q.H.**
(Prereq. HRM 1431)

This course explores basic traditional personnel functions, with an emphasis on the role of the personnel specialist. Functions include recruitment, selection, placement, training, and development of employees, as well as reward systems such as money and promotions. The recent challenge of new regulatory systems, such as affirmative action and occupational safety and health, on employment planning will be covered.

HRM 1345 Contemporary Labor Issues **4 Q.H.**
(Prereq. HRM 1431)

The course provides a study of current issues dealing with labor in its broadest sense. Labor unions and manpower institutions as well as the emerging development and training problems motivated by unemployment, poverty, and changing work patterns are discussed. Recent legislation dealing with the employment relationship is reviewed.

HRM 1348 Reward Systems: Wage, Salary, and Benefits Administration **4 Q.H.**
(Prereq. HRM 1431)

This course examines one of the major functions of personnel administration—compensation management—and its part in the overall personnel programs

of the organization. The analysis of reward systems as supportive mechanisms of management and the formulation of compensation policy and implementation of compensation systems are developed through simulation exercises and group projects, as well as lectures and cases.

HRM 1349 Selection and Assessment of Employees **4 Q.H.**
(Prereq. HRM 1432)

The course examines three influences of employee selection and testing: first, the legal aspect of selection, where the greatest uncertainty is found; second, the influence of industrial psychology on selection and decision-making techniques; and third, the area of personnel practices itself, that is, the methods employers find effective in coping with legal requirements. Basic issues and procedures such as EEO, decision strategies, and the utility and evaluation of selection and appraisal systems will be covered.

HRM 1431 Complex Organizations **4 Q.H.**
(Prereq. Middler standing)

The course examines the structure and dynamics of the complex organization. Focus is on the design of the organization and its basic subsystems (reward, control, selection, development). Students have the opportunity to explore how organizational structures help shape human behavior. Emphasis is on understanding the interrelations among organizational structures, tasks, and individual characteristics within the context of a changing environment.

HRM 1432 Organization Behavior **4 Q.H.**
(Prereq. Middler standing)

This course explores the effects of individual, interpersonal, group, and leadership factors on human behavior. Managerial applications of behavioral and social science concepts are also explored, including job design, job satisfaction, performance appraisal,

supervision, career dynamics, and organizational change. Emphasis is placed on helping the student develop skills in dealing with the human side of enterprise.

HRM 1501 Organizational Structure and Process
(Prereq. HRM 1432 and HRM 1431) **4 Q.H.**

An examination of various schools of management thought, including the classical, scientific management, human relations, and contingency approaches to management. This course also explores organizational concepts developed from research on organizations including: Interdependence, Uncertainty, Coordination and Differentiation-Integration. Readings and research findings will be applied to case examples of complex organizations.

HRM 1504 Strategies of Organizational Changes
(Prereq. HRM 1431) **4 Q.H.**

This course focuses on three basic areas: (1) organizations as stable systems that naturally resist both planned and unplanned change; (2) organizations as dynamic systems that continuously respond to both internal and external pressures for change; and (3) strategies and techniques for designing, implementing, and managing change. The role of the change agent will be discussed in this context.

HRM 1512 Motivation and Control
(Prereq. HRM 1431) **4 Q.H.**

This course provides an extensive analysis of various theories of motivation, including Herzberg's two-factor theory, expectancy theory, learning theory, need theory (McClelland), and competence motivation. This course also considers the behavioral implications of various organizational systems of measuring and controlling operations.

HRM 1515 Strategic Planning and Reward Systems
(Prereq. HRM 1432) **4 Q.H.**

A study of the process of strategic planning with an emphasis on problems in planning system implementation. The importance of developing reward systems that recognize management performance in strategic planning will be explored. Corporate planning and reward systems in both the United States and Japan will be studied. Cases, readings, and a term paper will be used.

HRM 1519 Leadership
(Prereq. HRM 1431) **4 Q.H.**

This course offers a study of the leadership function in a variety of organizational settings. Using a contingency approach, this course explores a range of possible leadership behaviors, relating the appropriateness of a particular style to a number of situational factors. Readings provide an opportunity to explore several contingency theories of leadership; cases allow for the application of these models; and videotaped role playing and self-assessment techniques permit the student to evaluate his/her own leadership style.

HRM 1520 The Changing Workplace: An On-Site View of Industrialization
(Prereq. HRM 1431) **4 Q.H.**

America, and New England in particular, is noted as the place where the genius of industrial innovators and managers brought the industrial revolution to its first real flowering. This course deals in depth with the interactions of technical, economic, social, and managerial factors as they evolved in forming industrial New England. Emphasis is on the nineteenth century although forces will be traced from colonial New England to the present. Focus is on the participants in this dynamic free enterprise process—the managers and workers—and the settings in which they worked and lived. The seminar format includes on-site studies of factory settings, mill reconstructions, museums, and the communities in which developments took place. The seminar also includes films, lectures, and individual tutorials. Each student is required to complete a research project.

HRM 1539 Managing Careers
(Prereq. HRM 1431) **4 Q.H.**

This course examines the tools for both self-assessment (investigating one's skills, abilities, needs, values, and interests) and career exploration (determining the nature of and requirements for entering and succeeding in various career fields). The goal of the course is to help students develop an individualized plan of action that summarizes a wide variety of data indicating an individual's present status and career goals, and the means by which to bridge the gap.

HRM 1542 Women in Management
(Prereq. Middler standing) **4 Q.H.**

This course explores contemporary worklife problems for both men and women. Topics include: sex role stereotyping—its origins and impact in organizational settings; sexual harassment and affirmative action; dual career couples and their implications for organizational design; sex differences in leadership and power.

HRM 1581 Managerial Skills Seminar
(Prereq. HRM 1431) **4 Q.H.**

This course offers a study of the nature of managerial work focusing on three key managerial roles—interpersonal, informational, and decisional. Behavioral determinants of administrative effectiveness are examined with an emphasis on the practical implications of and personal orientations to those key managerial roles.

HRM 1583 Seminar in Collective Bargaining
(Prereq. HRM 1431) **4 Q.H.**

The course focuses on the organization, negotiation, and administration of collective-bargaining relations between management and unions in different industries, services, and levels of government. Simulations of actual bargaining and an arbitration exercise are also a part of the course.

HRM 1591 Independent Study 1 Q.H.

For the student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

HRM 1592 Independent Study 2 Q.H.
Same as HRM 1591**HRM 1593 Independent Study 3 Q.H.**
Same as HRM 1591**HRM 1594, HRM 1595, HRM 1596, HRM 1597 Independent Study 4 Q.H.**
Same as HRM 1591**HRM 1760 International Labor Relations Systems (Prereq. HRM 1431) 4 Q.H.**

This course analyzes the labor relations systems of selected countries in comparison with that of the United States. The political, cultural, and economic forces that shaped these systems are also studied. Special attention will be given to such international institutions as multinational companies and the EEC. There will be cases, readings, and projects assigned.

HRM 1762 International Human Resource Management 4 Q.H.
(Prereq. Junior standing)

This course covers basic issues in human resources management relevant to managing in international and cross-cultural environments. Topics include

selection and training of personnel for work in multi-cultural environments, managing the international employee in the United States and abroad, cross-cultural communication, international environments, special issues of concern to small business, and change in multinational companies.

HRM 1822 Microcomputers in Human Resource Management 4 Q.H.

(Prereq. Honors participant or permission of instructor) With the help of microcomputers as a teaching tool, the course will cover the following topics: (1) the theoretical and conceptual aspects underlying the implementation of information systems and quantitative models in HRM; (2) the hands-on, nuts-and-bolts aspects of how to get set up, generate reports from, and maintain a computerized personnel database; and (3) the application of management-science models for human resource planning and forecasting.

HRM 1823 Human Resources Information Systems (Prereq. HRM 1332) 4 Q.H.

This course explores the conversion of computer processing and data management systems methods to personnel applications such as manpower planning, government report generation, report generation, skills inventory and career development, payroll, and project planning. The basic techniques of using HRIS to provide timely, economical information for managerial decision making are covered, including systems analysis (e.g. understanding user objectives and environment, data collection, data organization, system design, testing, system implementation, and evaluation).

HRM 1891 Honors Thesis in Progress 0 Q.H.**HRM 1892 Honors Thesis 8 Q.H.****HRM 1893 Honors Thesis in Progress 0 Q.H.****HRM 1894 Honors Thesis 12 Q.H.**

International Business Administration

INB 1338 Introduction to International Business (Prereq. Middled standing) 4 Q.H.

This focuses on the cultural, economic, and political aspects of domestic and foreign environments and their effect on the international operations of business firms. Topics covered include 1) the principles, patterns, and potential of international trade and investments; 2) the development of management strategies for international businesses; and 3) the organization and management of the firm's international operations.

INB 1352 Seminar in International Business (Prereq. INT 1338) 4 Q.H.

This course applies the concepts and skills acquired in other international and domestic courses to the

solution of managerial problems. It focuses on the task of solving significant managerial problems in international and foreign cultural contexts. Students' reports form a major part of this course and are expected to concentrate either on a functional business area related to international operations or on analyses of market opportunities and methods of entry in a foreign environment. Other instructional vehicles include case analyses and discussions of current issues.

INB 1501 Comparative International Management (Prereq. Middled standing) 4 Q.H.

The objective of this course is to help to develop the student's conceptual and analytical abilities to: 1) identify and analyze management systems in various

national settings and 2) understand the impact of economic, social, political, and cultural variables on management systems.

INB 1652 London Business Seminar

4 Q.H.

The special focus of this course is the development of multinational business in Europe and its effect on the economies of the EEC and the United States of America. Additionally the course will compare and contrast the marketing approaches of companies within two seemingly similar trading environments: the United Kingdom and the United States. Seminar topics include: impact of international integration on European business; effectiveness of multinational joint ventures; multinational marketing management; UK/USA comparative marketing strategies; growth and power of the retailer; branding, own label, generics—

the battle for supremacy. Case studies in this seminar are based on developing an international marketing program.

INB 1731 Cultural Aspects of International Business

4 Q.H.

Using a managerial perspective, this course will cover issues that arise when a firm moves from its home country to a host country that may have a different national culture. Although it will usually take the perspective of the U.S.-based firm that operates abroad, it will spend some time on what happens to other national firms operating in the United States and in third country environments. The way in which "corporate culture" evolves in the context of national culture and the impact on managers will be a central issue.

Management

MGT 1115 Introduction to Business

4 Q.H.

This course focuses on the business organization as a system of interrelated functions and operations, the interactions between the organization and its environment, and the role of management in business organizations.

MGT 1345 Legal Aspects of Business

4 Q.H.

This course examines the legal aspects of business transactions and business relationships involving contracts; sales, bulk transfers, and secured transactions under the Uniform Commercial Code; principal and agency; and suretyship and guaranty.

MGT 1446 Managing Social Issues

4 Q.H.

(Prereq. HRM 1431 and junior standing)

This course offers an analysis of environmental influences—economic, legal, technical, social, cultural, and ethical—affecting the corporation. The focus is on managerial decision making and relieving the tensions generated by these external factors.

MGT 1450 Business Policy

4 Q.H.

(Prereq. HRM 1431)

This course focuses on corporate strategy and its elements, including an analysis of the company, its resources, opportunities, environment, and decision makers. Emphasis is on decision making and implementation of strategy while operating a company in the context of a business simulation.

MGT 1571 The Law of Business Organizations and Commercial Paper

4 Q.H.

(Prereq. MGT 1345)

This course is an introduction to the legal aspects of the typical forms of business organizations, partnerships, corporations, and the rights, responsibilities, and liabilities involved. The course also covers the law governing commercial paper under the Uniform Commercial Code, and the Bankruptcy Reform Act of 1978.

MGT 1572 Law of Wills, Trusts, and Estates

4 Q.H.

Topics include requirements of valid will, claims of and against estates; the administration of estates,

both formal and informal; essential elements for the creation of a trust; kinds of trusts, including inter vivos and testamentary trusts; the rights, responsibilities, and liabilities of trustees; and the rights of beneficiaries.

MGT 1573 Bulk Sales and Bankruptcy

4 Q.H.

In examining bulk transfers, a detailed study is made of the Uniform Commercial Code, Article 6; the need of the transferor to give to the transferee a sworn list of all his creditors; the giving of notice to the listed creditors; the contents of the notice, what creditors are protected; and the legal consequences of failure to comply with the Code. The bankruptcy aspects of the course deal with both voluntary and involuntary bankruptcies; the appointment and duties of the trustee; provable and dischargeable debts; priority of debts; discharge and acts that bar a discharge.

MGT 1574 Law in Society

4 Q.H.

(Prereq. Middler standing)

The course is designed to provide students the opportunity to acquire a broad view of their legal rights, obligations, and responsibilities in their relations with others and with the state. Includes study of torts such as assault and battery, trespass, negligence, slander, libel, and deceit; and crimes such as homicide, assault and battery, robbery, arson, larceny, and burglary.

MGT 1591 Independent Study

1 Q.H.

For a student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MGT 1592 Independent Study Same as MGT 1591	2 Q.H.
MGT 1593 Independent Study Same as MGT 1591	3 Q.H.
MGT 1594, MGT 1595, MGT 1596, MGT 1597 Independent Study Same as MGT 1591	4 Q.H.
MGT 1720 Labor Law (Prereq. Middler standing) The purpose of this course is to help acquaint the student with the many constitutional and legal problems involved in labor organizing, industrial relations, labor negotiations, labor contract enforcement, and dispute resolution. Cases are studied for the legal principles underlying the common law, state and federal laws, and the constitutional questions of power and authority. The Sherman Act, Clayton Act, Norris-LaGuardia Act, and Labor Management Relations Act are considered.	4 Q.H.
MGT 1808 Honors: Seminar on the Management of Innovation (Prereq. Honors participant or permission of instructor) The management of technological innovation is of critical importance to American companies as they face increasing worldwide competition. Knowledge in the area is advancing rapidly and incorporates work from several disciplines, including strategy, marketing, organizational behavior, and finance. This course will be run as a research seminar. Students will be responsible for identifying relevant topics in the management of innovation and completing a research study. Students can work either individually or in small groups on the research topic they define. Students will be required to submit a research proposal, a progress report at mid-quarter, and a final paper and presentation.	4 Q.H.
MGT 1819 Honors: Seminar in Research (Prereq. MSC 1201) This seminar focuses on the definition of research in the context of the business environment, research methodologies, and the student's attempt at research	4 Q.H.

through a term project. Methodological issues include the formulation of concepts, hypotheses, and theories; the design of research projects; data collection; data analysis; and report writing. The term project involves investigation of a subject of interest to the student. The projects are intended to serve as prototypes of honors thesis.

MGT 1820 Independent Study (Honors) **4 Q.H.**
Directed study toward fulfillment of Honors Program requirements. Open only to students who have been accepted into the Honors Program. Procedures for arranging the Honors Independent Study are the same as those for MGT 1594.

MGT 1821 Honors: The Computer Software Industry—Strategy and Management **4 Q.H.**
This course is designed to introduce participants to the evolving structure and strategy of the computer software industry. Within the broad industry, the fastest-growing segments are custom systems and packaged software. The course will begin by explaining how environmental factors have led to the importance of packaged software, and go on to provide cases and readings that help the student to understand and analyze management policies and problems in this industry.

MGT 1826 Managing the Business Government Interface **4 Q.H.**
(Prereq. Honors participants or permission of instructor)
Managing the business-government relationship is an important business activity. This course will explore the "tools" available to the manager to influence the firm's position vis-à-vis the government. These tools will be applied to current issues, including product liability, government procurement, bail-outs, location incentives, industrial policy, and others.

MGT 1891 Honors Thesis in Progress **0 Q.H.**

MGT 1892 Honors Thesis **8 Q.H.**

MGT 1893 Honors Thesis in Progress **0 Q.H.**

MGT 1894 Honors Thesis **12 Q.H.**

Marketing

MKT 1331 Marketing Management (Prereq. MKT 1435) This course is designed to provide training in marketing decision making. Case studies simulating actual business settings are used to help students develop analytical abilities and sharpen their communications skills. Topics covered range from techniques used to analyze a market to the development of a total marketing strategy (product policy, pricing policy, promotion policy, and distribution policy).	4 Q.H.
MKT 1341 Marketing Research (Prereq. MKT 1331) This course focuses on the survey research process and the analysis of data using "canned" computer	4 Q.H.

programming routines. Among the topics covered are: 1) problem definition, 2) research design, 3) sampling techniques, 4) questionnaire development, 5) data collection methods, and 6) data analysis. Students are expected to work on group projects with participating firms. No previous computer experience required.

MKT 1351 Competitive Strategy **4 Q.H.**
(Prereq. MKT 1331)
A capstone marketing course, required of all students with a marketing concentration. The focus is on the formulation of marketing strategy at a policy level and its implementation in a dynamic environment.

MKT 1435 Introduction to Marketing 4 Q.H.
(Prereq. Middler standing)

This course consists of lectures, readings and small-group discussions on the role of marketing in contemporary society, in the business enterprises, and in the nonprofit organization. Consideration is given to the planning, operation, and evaluation of marketing and promotional efforts necessary to the effective marketing of consumer and industrial products and services in both profit and nonprofit organizations.

MKT 1501 Introduction to Retailing 4 Q.H.
(Prereq. Middler standing)

This course explores the range of retail firms that comprise the retailing industry, from large mass merchandisers to small specialty outlets. The functions, practices, and organizations of various store types are examined. Current issues, career opportunities, the environment of retailing and retailing's role in the economy are among topics considered.

MKT 1503 Retail Merchandising and Control 4 Q.H.
(Prereq. MKT 1435 or permission of instructor)

This course examines the concepts and techniques of store operations and merchandise management. Topics such as calculating and planning markups and markdowns, pricing, inventory control, stock turn, open-to-buy, profitability analysis, and expense control are considered.

MKT 1507 Retail Strategies and Problems 4 Q.H.
(Prereq. MKT 1435; junior or senior standing or permission of instructor)

This course considers strategic and policy decisions of major retail enterprises engaged in food, apparel, and general merchandise distribution. The evolution of retail institutions is analyzed along with the characteristics of and prospects for new store types.

MKT 1512 Marketing for Nonprofit Organizations 4 Q.H.
(Prereq. Middler standing)

This course examines the unique characteristics of marketing in public and nonprofit enterprises. It aims to expand the scope of marketing management concepts beyond the traditional setting of business. Particular attention is paid to the basic decision-making differences between public and private firms. The course involves case analysis, assigned readings, and a group project.

MKT 1513 Direct Marketing 4 Q.H.
(Prereq. MKT 1331)

Direct marketers use direct response advertising to generate immediate, measurable responses—either direct sales or requests for more information—from their prospects and customers. This course will focus on starting and managing mail-order catalog businesses; conducting consumer and business-to-business direct mail campaigns; preparing telemarketing programs; and creating newspaper, magazine, radio, and television direct-response advertising.

MKT 1515 Marketing in the Service Sector 4 Q.H.
(Prereq. MKT 1435)

The course provides a basic treatment of methods and techniques for marketing in the service sector, which includes sports, recreation, public service, banking, insurance, and hotels. In addition to the principles covered, a number of descriptive studies will be analyzed covering the application of such marketing principles in key service areas.

MKT 1523 Advertising Management 4 Q.H.
(Prereq. MKT 1331)

This course focuses on the management of the advertising function in relation to a firm's overall marketing objectives. The course approaches the subject from the perspective of the user of advertising (e.g., product manager, marketing manager). Case studies and text material are used to help the student develop decision-making skills.

MKT 1531 Sales Management 4 Q.H.
(Prereq. MKT 1331)

This course is designed to help the student develop decision-making skills necessary for both building and maintaining an effective sales organization. Cases and readings are used to examine the strategic and operating problems of the sales manager. Major topic areas include the selling function, sales management at the field level, and the sales executive.

MKT 1536 Brand Management 4 Q.H.
(Prereq. MKT 1331)

This course focuses upon the management and development of brand strategies as well as the management of the product mix in the multi-product firm. Topics include evaluating and planning new consumer product introductions, identifying and screening new product opportunities, evaluating market performance, segmenting the product/market, and managing the product line.

MKT 1540 Marketing Channels 4 Q.H.
(Prereq. MKT 1435 or permission of instructor and junior or senior standing)

This course studies marketing structures and institutions: their evolution, functions, interrelations, and the management of their role in the marketing process.

MKT 1542 Industrial Marketing 4 Q.H.
(Prereq. MKT 1331)

This course examines the marketing of products where business firms are the potential customers. Upperclass elective, open to juniors and seniors.

MKT 1545 New Product Development 4 Q.H.
(Prereq. MGT 1450)

For most firms, coping with the problems of environmental change through modification of the product line is both vital and difficult. This seminar is concerned primarily with the examination and analysis of the problems firms face in directing and managing their new product development activities.

MKT 1553 Foundations of Consumer Behavior

(Prereq. MKT 1331)

4 Q.H.

This course is concerned with helping students develop an understanding of consumer attitudes and behavior processes as the basis of the design of marketing problems. Consideration is given to economic and behavioral models of consumer behavior and to underlying behavioral theories and concepts.

MKT 1560 Marketing Information and Decision**4 Q.H.**

(Prereq. MKT 1331 or junior or senior standing or permission of instructor)

This course considers state-of-the-art marketing information systems and computer-based business aids. Their applicability to various marketing management situations is explored. "Hands-on" experience is provided through the use of actual business case studies.

MKT 1573 Workshop in Negotiations**4 Q.H.**

(Prereq. Junior or senior standing)

The objective of this course is to aid students in improving their understanding of the negotiations process and their ability to plan and conduct negotiations effectively. Class activities involve readings, lectures, and discussions, as well as numerous case discussions and live and videotaped role-play negotiation exercises.

MKT 1580 Quantitative Methods in Marketing

(Prereq. MSC 1201)

4 Q.H.

This course focuses on statistical methods and techniques commonly used in the analysis and interpretation of survey and experimental data. "Canned" computer programs will be used extensively to illustrate the applicability of the methods discussed. No previous computer experience required.

MKT 1591 Independent Study**1 Q.H.**

For the student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of

the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MKT 1592 Independent Study**2 Q.H.**

Same as MKT 1591

MKT 1593 Independent Study**3 Q.H.**

Same as MKT 1591

MKT 1594, MKT 1595, MKT 1596, MKT 1597**Independent Study****4 Q.H.**

Same as HRM 1591

MKT 1760 International Marketing**4 Q.H.**

(Prereq. MKT 1435)

This course is designed to help familiarize the student with those aspects of marketing that are unique to international business within the framework of traditional functional areas of marketing. The focus is on the environment and the modifications of marketing concepts and practices necessitated by environmental differences. Topics include cultural dynamics in international markets, political and legal environmental constraints, educational and economic constraints, international marketing research, international marketing institutions, and marketing practices abroad.

MKT 1805 Honors: Marketing and Public Policy**4 Q.H.**

This course consists of an examination of major public policy issues of concern to marketers. These issues include advertising substantiation, unfair and deceptive advertising, product defects, advertising to children, advertising of alcoholic beverages and tobacco products, and pricing practices. The course will draw heavily on the past and present activities of the Federal Trade Commission and will use staff reports, judges' reports, commission decisions, as well as the evidence provided by companies in response to FTC actions.

MKT 1891 Honors Thesis in Progress**0 Q.H.****MKT 1892 Honors Thesis****8 Q.H.****MKT 1893 Honors Thesis in Progress****0 Q.H.****MKT 1894 Honors Thesis****12 Q.H.**

Management Science

MSC 1200 Business Statistics I**4 Q.H.**

(Prereq. MTH 1114)

Statistics is a methodology concerned with data collection, analysis, and interpretation. Information generated by statistical methods is used for analyzing decisions in the face of uncertainty. This course introduces fundamental concepts and methodology of probability, probability distribution, Bayesian revisions, estimation, and hypothesis testing.

MSC 1201 Business Statistics II**4 Q.H.**

(Prereq. MSC 1200)

Continuation of MSC 1200. Topics include chi-square tests, simple and multiple regression-correlation analysis, and elementary concepts of decision theory.

MSC 1226 Introduction to Data Processing**4 Q.H.**

This course is designed to introduce the business student to those aspects of modern data processing techniques vital to his/her future job performance.

During the first part of the course the student will have the opportunity to learn to program in the BASIC language on the University's VAX 11/780 time-sharing system. The second part of the course deals with the history of data processing, computer hardware and software, and an overview of the creation and operation of management information systems.

MSC 1433 Quantitative Models in Business 4 Q.H.
(Prereq. MSC 1201)

A model is a simplified representation or abstraction of reality. The focus of this course is on the construction of appropriate mathematical models for managerial decision-making problems. Criteria for selecting various stochastic and deterministic models are discussed. Specific topics included are decision trees, decision analysis, linear programming, and simulation.

MSC 1441 Operations Management 4 Q.H.
(Prereq. MSC 1201)

Operations Management is concerned with the productive system of an enterprise whereby inputs of technology, materials, personnel, and information are transformed into useful goods and/or services. The principal objective of this course is to introduce the student to the types of problems and issues encountered by the operations manager. Various models and techniques will be discussed, but the emphasis is on problem formulation and managerial implications.

MSC 1501 Purchasing and Materials Management 4 Q.H.
(Prereq. MSC 1441)

Concerned with decisions related to the flow of materials from supplier to point of use. Special emphasis on problems related to purchasing, including negotiation, value analysis, supplier selection, etc. While greater emphasis is placed on materials management in manufacturing organizations, nonprofit and nonmanufacturing concerns are also included. Instructor applies latest research in field gleaned from projects sponsored by the National Association of Purchasing Management and the American Production and Inventory Control Society.

MSC 1511 Operations Planning and Control 4 Q.H.
(Prereq. MSC 1441)

This course focuses on the planning and control necessary for an enterprise to respond to customer demand. Specific topics include the design of the planning and control system, inventory planning and control, forecasting for operations planning, and operations scheduling.

MSC 1523 Production Management 4 Q.H.
(Prereq. MSC 1441)

A continuation of MSC 1441.

MSC 1553 Decision Analysis 4 Q.H.
(Prereq. MSC 1201)

This course focuses on the analysis of decision making with particular emphasis on realistic problems under uncertainty. The course aims to help

improve the student's ability to make better decisions through a careful consideration of alternative courses of action and their consequences, relevant objectives, and the element of risk. Topics include the basic components of decision problems, the concepts of risk and utility, decision trees, and value of information and multicriteria decision making.

MSC 1562 End User Computing 4 Q.H.

An overview of the large and rapidly growing collection of software geared towards the needs of the nontechnical end user. Topical coverage will include discussion of various software packages (such as spread sheets, data bases, and graphics) for use on both mainframe and personal computers.

MSC 1564 High-Technology Operations Management 4 Q.H.

(Prereq. MSC 1441)

High-technology industries are usually characterized by greater degrees of innovation and faster rates of obsolescence of products and capital equipment than other industries. In addition, they are supported by manufacturing operations that are at the early phases of the learning curve. This course deals with the importance of these factors, and the application of the tools and techniques of operations management to firms operating in a high-technology environment. It is recommended for students interested in careers in high-technology manufacturing industries and also for those who analyze the manufacturing potential of high-technology firms, such as analysts for venture capitalists, and consultants.

MSC 1571 Management Information Systems 4 Q.H.
(Prereq. MSC 1427 and junior standing)

This course will examine the design, implementation and operation of management information systems (MIS), and those characteristics of MIS that have the greatest impact on the effectiveness and efficiency of business organizations. Emphasis will be placed on computer-based systems that support managerial decision making, planning, and control. The course will include a computer project using a data base management system.

MSC 1591 Independent Study 1 Q.H.

For the student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MSC 1592 Independent Study Same as MSC 1591	2 Q.H.
MSC 1593 Independent Study Same as MSC 1591	3 Q.H.
MSC 1594, MSC 1595, MSC 1596, MSC 1597 Independent Study Same as HRM 1591	4 Q.H.
MSC 1823 Honors: Managerial Applications of Artificial Intelligence Artificial intelligence is currently being brought into the commercial limelight after twenty-five years of basic research and application to problems in the fields of medicine, engineering, and the basic sciences. This course focuses upon existing and expected managerial applications in a variety of industries. It will include readings from relevant literature, guest lecturer presentations, and site visits. In addition, student teams will attempt to develop prototypical expert systems for specific managerial decision making problems in actual field settings.	4 Q.H.

MSC 1824 Honors: Micro-Computer Models for Operations Management The course will focus on the application of and experimentation with operations management models developed for use on microcomputers. The topics include: forecasting, inventory management, materials requirements planning, project scheduling, resource allocation in a capacity constrained operating system, and, if time permits, one or two additional OM models. The course will include an introduction to each model followed by practical application using a case study. Each case is structured so as to require use of the microcomputer to evaluate alternative solutions. It is possible that, instead of case studies, student teams apply two or more of the models to specific, existing problems in industry.	4 Q.H.
MSC 1891 Honors Thesis in Progress	0 Q.H.
MSC 1892 Honors Thesis	8 Q.H.
MSC 1893 Honors Thesis in Progress	0 Q.H.
MSC 1894 Honors Thesis	12 Q.H.

Transportation

TRN 1333 Principles of Transportation (Prereq. ECN 1105 and middler standing) Topics include the political, social, and economic functions of transportation; development and structure of the domestic transportation system; the nature of government regulation and promotion of the several modes.	4 Q.H.
TRN 1335 Current Issues in Transportation (Prereq. TRN 1333) This course provides an overview of the regulatory process and its impact on the domestic transportation system; critical examination of topical policy issues that confront carriers, shippers, and the agencies of regulation.	4 Q.H.
TRN 1344 Physical Distribution Management (Prereq. Junior standing) This course is concerned with movement, distribution, and control of raw material and finished goods flows. Examination of the importance of inventory control, scheduling, warehousing, and transportation in the design and operation of distribution systems.	4 Q.H.
TRN 1353 Seminar in Transportation and Distribution (Prereq. TRN 1353 and TRN 1337) This is a discussion- and research-oriented course that focuses on a limited number of advanced transportation and distribution topics. Included is interaction with business and government through individual research on the topic chosen for presentation by the student. Also see course MGT 1594 for Independent Study.	4 Q.H.

TRN 1514 Carrier Management (Prereq. TRN 1333) This course examines the transportation system from the carrier's viewpoint; managerial response to a heavily regulated and rapidly expanding environment; focus on carrier decision making involving routes, scheduling, financing, and pricing of services.	4 Q.H.
TRN 1528 Urban Transportation This course focuses on the movement of people and freight in and around metropolitan areas. Study includes a management approach to the planning, implementation, and operation of mass transit systems. Interrelations of transit with other urban programs, the auto mode, and the government/public sector will be discussed.	4 Q.H.
TRN 1545 Air Transportation (Prereq. TRN 1333) The course offers a managerial perspective on economics and regulation of aviation. The course probes aspects of commercial aviation, passenger and cargo, transportation, and key areas of general aviation.	4 Q.H.
TRN 1591 Independent Study For the student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under	1 Q.H.

whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

TRN 1592 Independent Study 2 Q.H.
Same as TRN 1591

TRN 1593 Independent Study 3 Q.H.
Same as TRN 1591

TRN 1594, TRN 1595, TRN 1596, TRN 1597 Independent Study 4 Q.H.
Same as HRM 1591

TRN 1721 Transportation Labor 4 Q.H.
(Prereq. TRN 1333)

This course focuses on the significance of the labor component in the transportation industries. Attention is devoted to trends in employee compensation, productivity, and bargaining patterns. Also examined are

the role of government in this area and the impact of transportation labor on shippers, carriers, and consumers.

TRN 1760 International Transportation and Distribution Management 4 Q.H.

This course examines the present and future status of United States and world ocean and air transportation in international trade and development. The economic, regulatory, financial, and operating characteristics of these forms of carriage are examined with primary emphasis given to their impact on international trade patterns. Other topics include government promotion, subsidy, and technological innovation.

TRN 1891 Honors Thesis in Progress 0 Q.H.

TRN 1892 Honors Thesis 8 Q.H.

TRN 1893 Honors Thesis in Progress 0 Q.H.

TRN 1894 Honors Thesis 12 Q.H.

Counseling Psychology, Rehabilitation, and Special Education

CRS 1030 Introduction to Emotional Disturbances in Children 4 Q.H.

Review of emotional processes that interfere with learning behavior and a study of approaches used to deal with behavioral disorders. Emphasis is on classroom management techniques, use of consultation, and parent-teacher interaction.

CRS 1200 Introduction to Special Education 4 Q.H.

A survey of the characteristics and the social, emotional, and educational adjustment of special-needs individuals. The effects of society's attitudes, the individual's own attitude toward the handicap, and the effect of the handicap itself are evaluated. Current legislation will be reviewed.

CRS 1300 Introduction to Learning Disabilities 4 Q.H.

This course surveys behavioral characteristics of children who present specific deficits in perceptual, integrative, or expressive processes that impair learning efficiency. Students are expected to work to develop competencies in diagnosing curriculum materials and teaching methods.

CRS 1301 Diagnostics in Special Education 4 Q.H.
(Prereq. CRS 1200 and CRS 1300)

Students should work to develop competence in 1) observing, recording, and analyzing children's behavior and learning environments, including continuous measurement and informal assessment of general, specific, and behavioral learning needs; and 2) techniques of formal assessment of general, specific, and behavioral learning needs.

CRS 1302 Methods and Materials of Teaching in Special Education 4 Q.H.

(Prereq. CRS 1200, CRS 1300, CRS 1301, or senior status)

Course instruction will focus on the following areas: 1) development and implementation of individualized educational plans, including task analysis, adaptation and selection of materials, strategies in applied classroom management techniques; and 2) adaptation and selection of materials and strategies in language arts, mathematics, and perceptual-motor skills.

CRS 1304 Socio-Psycho Dynamics of Family Life 4 Q.H.

An introduction to and survey of the internal and external dynamics of family life. The significance of such dynamics to the mental health of the special-needs child will be examined. The approaches to working with parents and the school-home relationships, as well as the effects of disability on the family, are explored.

CRS 1305 Psychology of the Mentally Retarded 4 Q.H.

Analysis of the etiology, nature, and needs of the retarded individual, emphasizing cognitive and psychosocial development. Implications of these characteristics for life-span management are explored in conjunction with parental and community attitudes and involvement.

CRS 1306 Introduction to Rehabilitation 4 Q.H.

Overview of and orientation to the field of rehabilitation, including its historical development, psychological implications, and sociological dimensions. Special

attention is paid to rehabilitation of specific disability groups such as the physically disabled, emotionally disturbed, mentally retarded, alcoholic, drug dependent, and public offender.

CRS 1310 Intervention Strategies for the Human Services 4 Q.H.

(Prereq. ED 1302)

Introduction to the wide range of skills used in working with clients in the various helping professions, e.g., counseling (individual and group), advocacy, rehabilitation, community organizing, income maintenance, etc. Taught primarily through role playing, simulations, and interviews with practicing professionals; also readings, but no fieldwork requirement. Intended as preparation for more specialized courses. Required for Human Services majors but open to other students with appropriate backgrounds.

CRS 1313 Introduction to Group Counseling 4 Q.H.

(Prereq. CRS 1314)

This course provides a foundational exposure to the theory and skills of group counseling as it is practiced in various human service settings. Topics cover developmental stages of counseling groups: approaches to leadership style, and strategies for starting, maintaining, and terminating the counseling group. The course includes an opportunity for students to practice rudimentary skills of leadership of counseling groups and to become involved in focused group process activities.

CRS 1311 Case Management: Diagnosis and Treatment 4 Q.H.

(Prereq. SOC 1100 or PSY 1111)

The course offers an introduction to the basic theory and skills of managing client's treatment programs in a variety of institutional settings. Students receive training to identify the components of a psychosocial assessment, examine commonly used techniques of planned service delivery and resource coordination, and review the diverse entitlements that are available

to clients of diverse needs and backgrounds. Much of the instruction will occur in a seminar-like format.

CRS 1312 Introduction to Family Systems Counseling 4 Q.H.

(Prereq. CRS 1314)

This course provides an introduction to the concepts and skills of family systems therapy, a counseling orientation in which the family is the chosen social unit of assessment and intervention for the client's problem. The course covers major approaches within communications and structural frameworks, emphasizing implications for normal family development and interventions in dysfunctional systems, and addresses theory and strategies for working with marital and parenting subsystems. Course offers students a beginning opportunity to experience the manner in which their family affects their functioning in various social systems with which they have professional contact.

➤ **CRS 1314 Introduction to Counseling** 4 Q.H.

This course presents an exposure to major theoretical approaches to counseling. Students will receive training and practice in listening skills and are expected to develop facilitative responses. Classroom work will combine didactic presentations and experiential activities to assist students in understanding and implementing a variety of counseling approaches.

CRS 1800 Directed Study 4 Q.H.

(Prereq. Permission of instructor)

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. Preparation: Approval of the supervising faculty member and of the Dean's Office of the Boston-Bouvé College of Human Development Professions. Approval forms must be submitted to the Dean's Office during the quarter prior to registration for the Directed Study.

Department of Education

ED 1003 Reading/Study Skills I 4 Q.H.

Designed to provide instruction to students who demonstrate a need to be more efficient in comprehending and studying college textbooks and collateral reading assignments. This course will concentrate on techniques involved in understanding informative materials and introduce students to the evaluation of persuasive prose. In addition, suggestions will be presented on such topics as how to listen to and take summary notes on course lectures and how to set study goals and priorities consistent with course objectives.

ED 1004 Reading/Study Skills II 4 Q.H.

This course is an extension of Reading/Study Skills I and will expand upon the analysis and interpretation

of persuasive texts. Other topics emphasized include reading imaginative prose for meaning and pleasure, preparing for and taking examinations, and learning to adjust reading speed and method to various materials encountered in concurrent courses.

ED 1005 Practicum in Reading and Study Skills 4 Q.H.

This course is designed to give students in the academic program, Project Ujima, comprehensive tools to help them to master the "how to" of reading textbooks, notetaking, outlining, introductory research skills, time management, studying skills, and other techniques necessary for success in college. The skill areas covered can be applied to other courses that students may be taking.

ED 1100 Education and Social Science 4 Q.H.

An interdisciplinary course that draws on anthropology, psychology, and sociology, and exposes students to some of the concepts, methods, and terminology of these fields. Main themes are the evolution of human nature, the influence of previous experience and learning on the behavior of individuals and groups, difficulties in achieving a full degree of humanity in a technological society, and the potentially powerful roles that "professional socializers" (teachers, clinicians, group leaders, etc.) can play in the lives of students and clients.

ED 1101 Education for the Future: A Creative and Humanistic Approach 4 Q.H.

Students in this course will be given the opportunity to gain a perspective on the array of conflicting learning experiences that bombard their lives; to identify the factors that influence what people learn and from whom; to evaluate the potential effects of these learnings. As a consequence, the students will be encouraged to develop frames of reference through which to examine their own roles in the education process. A creative and humanistic approach to teaching is the basis for all the work in this course.

ED 1102 Human Development and Learning I 4 Q.H.

Developmental processes from prenatal life up to adolescence. Theories of learning and personality with research and case material covering major aspects of psychological development.

ED 1103 Human Development and Learning II 4 Q.H.

Basic overview of the continuity of human development in contemporary society, from the pre-adolescent period through adolescence, adulthood, middle age, and old age. Significant areas of growth, development, and adjustment for each period are considered, including social, sexual, personality, motivational, and cognitive aspects. ED 1102 is not prerequisite for this course.

ED 1104 Analysis of the Instructional Process 4 Q.H.

Students examine conflicting theories about the nature of teaching and learning. The effects of traditional and innovative educational systems upon learners are evaluated. Educational tools for describing, analyzing and evaluating aspects of learning and teaching are identified and their use by students is refined during sequential field observations and class meetings.

ED 1105 Day Care and Nursery Schools: Social and Cultural Origins 4 Q.H.
(Prereq. ED 1100 or equiv.)

An exploration of the origins of the increased contemporary use of out-of-the-family child care arrangements in the United States and in selected European and Third World nations. Course topics include the interrelation of industrialization, technology, and family functioning; contrasting varieties of child care centers

in operation today; and effects of the proliferation of child care centers on other aspects of society, such as neighborhood life, business, parents' lifestyles, elementary school curricula, government spending, and the job market in education and human services. Three to four hours per week of fieldwork in a child care setting are required of each student.

ED 1106 Creative Expression in Children 4 Q.H.
(Prereq. ED 1102)

Designed to assist students who are interested in working with children in a variety of settings. Discussion focuses on the potentials of creative expression in interpersonal communication; the relation of children's creative experiences to their cognitive, emotional, and social development; and the opportunity to acquire the hands on experience and confidence to work with various media available for creative expression.

ED 1300 Education and Psychosocial Development 4 Q.H.

(Prereq. ED 1100 or equiv.)
Theories and research on the socialization functions of education. Topics covered include the relative influence of early vs. post-childhood socialization and the role of diverse educational experiences and institutions in personality development.

ED 1301 Educational Applications of Social Psychology 4 Q.H.

(Prereq. ED 1102 or ED 1103)
Focus is on theory and research in social psychology especially relevant to education. Areas covered are prejudice in the classroom; the school as a setting for manifestation of authoritarian personality, attitude organization and change in an educational environment; the class and the clique as "small groups," the expression of need for achievement in various school structures; related topics.

ED 1302 The Human Services Professions 4 Q.H.
(Prereq. ED 1100, SOC 1100, or equiv.)

Explores what a human service agency is, how it comes into being, how it grows and changes. Attitudes, values, skills, and knowledge of the human services worker are analyzed, as are reasons why people in modern society require human services assistance. Human services are viewed from the eyes of clients as well as society as a whole. Fieldwork in a human service agency is a major course component, as is a good deal of independent study. Required for all human services majors; open to other students on space-available basis.

ED 1303 Mental Health in Teaching 4 Q.H.
(Prereq. ED 1102 or ED 1103)

Factors involved in the choice of teaching as a career and psychological and occupational factors that contribute to teacher happiness, dissatisfaction, adjustment, and maladjustment. Examination of these factors is a background against which to consider: 1) what teachers can do to foster healthy personalities,

2) how to deal with psychological forces in the classroom, and 3) steps to strengthen the emotional development of the normal child.

ED 1304 Language and Cognition: Educational Implications 4 Q.H.

(Prereq. ED 1102 or ED 1103)

Development of language and thought in the child: concept learning, problem solving, and language acquisition. Particular consideration given to the implications of current research and theory in these areas for educational practice.

ED 1305 Cross-Cultural Studies of Child Rearing and Education 4 Q.H.

(Prereq. ED 1102 or ED 1103)

Child rearing and child life in contrasting cultures around the world. Emphasis is on cognitive, emotional, and behavioral outcomes of concern to American educators, human services workers, and parents. Consideration is given to alternative patterns of child rearing possibly useful in modern society. Readings focus primarily on ethnographic descriptions of particular cultures and psychological comparisons of children from contrasting backgrounds.

ED 1306 Measurement and Evaluation 4 Q.H.

Emphasis in this course is on evaluation techniques for use in the classroom and teaching-learning situations at all levels. The importance of establishing behavioral objectives as a basis for evaluation also will be emphasized. Considerable emphasis will be placed on improving teacher-made (instructor-made) tests, especially objective-type tests. Students will be required to construct an objective test in their discipline for an instructional unit. Other evaluation techniques besides tests will be reviewed. Brief attention will be given to standardized measurement instruments of ability and achievement as they may be used in the evaluation of pupil progress.

ED 1307 Introduction to Educational Statistics 4 Q.H.

Emphasizes descriptive statistics useful in the evaluation of educational and related professional activities. Topics ordinarily covered include statistical notation, variability, probability, sampling techniques, linear regression, correlation, t-tests, and chi-square tests of significance. Examples of applications of these techniques will be drawn, so far as possible, from the fields for which students in the course are preparing, and may vary from quarter to quarter.

ED 1308 Education and Social Change 4 Q.H.

(Prereq. ED 1100 or equiv.)

A sociological exploration of educational systems as independent and dependent variables in social change. Instances of planned educational change in various countries and their implications for contemporary American society.

ED 1309 Organization and Politics of School Systems 4 Q.H.

(Prereq. ED 1100 or equiv.)

The political sociology of school systems in the United

States. An analysis of the power and authority structures in contemporary education. Who decides what and how? Who controls the system? How are the various interest groups organized? What are the mechanisms for conflict resolution? The relation between professional and nonprofessional interest groups.

ED 1310 Class and Ethnic Relations in Education 4 Q.H.

(Prereq. ED 1100 or equiv.)

The various ways in which the American class system and patterns of ethnic group relations have affected, and have been affected by, American education. The limitations and potential of educational institutions with respect to the resolution of intergroup conflicts and the establishment of equal educational opportunities.

ED 1311 Schools as Social Systems 4 Q.H.

(Prereq. ED 1100 or equiv.)

Analysis of schools as sociocultural subsystems within the larger society. Functional interrelation between student and school subcultures, status and role systems, authority structures in American schools.

ED 1312 Comparative Education 4 Q.H.

A comparison of the national school systems of selected foreign countries with the school system in the United States. Course content includes comparative data in the fields of teaching, speech and hearing, special education, and human services.

ED 1313 Current Issues in American Education 4 Q.H.

An analysis of the variety of current issues confronting teachers, speech and hearing clinicians, special education practitioners, and human services specialists. Attempts will be made to place these issues in a historical context.

ED 1314 Philosophy of Education 4 Q.H.

Objective is to help participants examine their own purposes in relation to those of the school as an institution. Course reading material will consist primarily of philosophical writings on topics such as the ethics of educational intervention, the delineation of educational concepts, the educational messages of long-range speculations and utopias, and normative assumptions underlying educational policies.

ED 1315 Seminar in Human Learning and Motivation 4 Q.H.

(Prereq. ED 1102 or ED 1103)

Survey and analysis of the literature on human learning and motivation. Emphasis on interaction between human learning and motivation in the developmental process and the classroom.

ED 1316 Seminar in Adolescent Psychology 4 Q.H.

(Prereq. ED 1103)

In-depth examination of motivational, intellectual, social, and emotional development of adolescents, from end of pre-adolescence to beginning of young adulthood. Special attention is given to current issues such as drug use, sexual behavior, and vocational

choice. Each student is expected to examine a topic of choice in some depth.

ED 1317 Seminar in Group Process 4 Q.H.

A study of the structure, dynamics, and function of face-to-face groups to learn about goal achievement and task orientation. The course operates mainly by committee or group instrumentation. The serious student should work to gain an understanding of the function of informal relationships within formal organizations, the various roles within groups, peer relationships, superior-subordinate relationships, authority and intimacy, and the inclusion and exclusion processes.

ED 1318 Seminar in Early Childhood Development (Prereq. ED 1102) 4 Q.H.

The theory and research regarding the cognitive, personality, and social development of children from birth to six years, with respect to the implications for early childhood education. Various existing programs examined and new directions explored.

ED 1400 Fundamentals of Reading I 4 Q.H.

This is the introductory course in developmental reading for prospective Early Childhood and Elementary teachers. Emphasis is on beginning reading as it relates to the clinical environment. Areas of skill development, such as word recognition and meaning comprehension, are studied in detail, as are some methods and techniques of testing and grouping. Also included are an introduction to some reading books and materials, methods of teaching, and the psychology of learning to read.

ED 1401 Introduction to Reading 4 Q.H.

This introductory course for noneducation majors examines reading as a psycholinguistic process. Precursor skills and abilities, word recognition, and comprehension are considered in light of the perceptual and language functions which inform them. Relevant research and theoretical models are presented. Attention is given to diagnosis and instruction of deficient populations. Reading instruction as carried out in most elementary schools today is examined from the perspective of current knowledge about children's linguistic and cognitive development. Methodology is considered where appropriate.

ED 1402 Fundamentals of Reading II 6 Q.H.
(Prereq. ED 1400)

A continuation and extension of Fundamentals of Reading I. Study skills; speed and fluency development areas. The tutorial work is extended and the student is given further opportunity to achieve familiarity with books, materials, and methods.

ED 1403 Remedial Reading 4 Q.H.
(Prereq. ED 1402)

For prospective teachers, this course may assist in familiarizing the student with some of the most commonly known reading problems in the typical classroom as well as in the Reading Clinic; analysis and evaluation of the typical diagnoses of such problems

and corrective programs. Tutorial work with a retarded reader, with each student keeping a log or journal of work with a particular reading problem.

ED 1404 Linguistics and Reading 4 Q.H.
(Prereq. ED 1402)

The course explores the nature of language and relevant English language systems to help students acquire a linguistic perspective on the reading process and reading instruction. Pedagogical implications are examined in light of current knowledge about children's language acquisition and use. Early structural linguistic proposals for teaching reading are evaluated; considering recent psycholinguistic models of the reading process. Issues concerning the language-different child are discussed.

ED 1405 Literature and Learning Materials for Children and Young Adults 4 Q.H.

This course offers a comprehensive survey of the field of children's literature and literature for young adults. Although it is designed specifically for prospective teachers (and, in fact, is required of all Early Childhood and Elementary Education majors), it may also be taken as an elective by all students. Students will survey and evaluate examples of contemporary children's literature and other learning materials used in preschool, elementary, secondary, and remedial programs. Covered in this course are such recurring themes as: racism and sexism in children's books; controversial books for young children; contemporary illustrators; banned books, etc.

ED 1406 Elementary Education Curriculum I 4 Q.H.

Various patterns of organizing elementary school curriculum are analyzed on the basis of the general objectives of the public school system in the United States. Students are expected to evaluate and to organize units of work that can accommodate children at different developmental levels. The integrated approach to curriculum organization is emphasized with language arts, music, and arts as central focus.

ED 1407 Elementary Education Curriculum II 4 Q.H.
(Prereq. ED 1406)

Social studies curricula in use in elementary school are described and evaluated. Criteria are developed to select appropriate social studies content, skills, and attitudinal objectives. Students are expected to use these criteria to develop social studies experiences that meet the developmental needs of learners and shed light on the lives of individuals and groups within different cultural settings.

ED 1408 Elementary School Math 4 Q.H.

This is a course in methods and materials of mathematics for Early Childhood and Elementary Education majors. This course provides the opportunities for University students to explore various strategies and materials of teaching mathematics in a manner that takes in account the developmental stages of children.

ED 1409 Elementary School Science 4 Q.H.

This is a course in methods and materials of science for Early Childhood and Elementary Education majors. This course offers the student the opportunity to explore some limited but varied content areas in science and to consider how these areas can be taught to children.

ED 1410 Methods and Materials for Teaching Adolescents and Adults I 4 Q.H.

(Prereq. ED 1104)

Consideration of specific methods and materials appropriate to teaching adolescents and adults to develop in the students an understanding of the complexities of the materials and methodology of the teaching-learning process, to encourage within students attitudes conducive to and identified with good tenets of teaching, to foster in the students acceptance of the need to grow constantly and to be aware of the continuing development of the learning-teaching process.

ED 1411 Methods and Materials for Teaching Adolescents and Adults II 4 Q.H.

(Prereq. ED 1410)

This course is sectioned according to the various subject areas of teaching techniques of organizing and presenting lessons, developing teaching materials, using audiovisual equipment, developing and implementing evaluation instruments, and selecting appropriate materials within the field of interest.

ED 1412 Fundamentals of Curriculum Development 4 Q.H.

An examination of how goals and objectives are selected and priorities are determined. Methods for designing educational programs to meet specified goals and methods of evaluating educational outcomes in terms of the goals of the program and techniques for modifying programs in the light of such performance.

ED 1413 Writing and the Teaching of Writing 4 Q.H.

A study of the logical and rhetorical bases of exposition and argumentative writing; relationships of assumptions, assertions, and implications; the nature of proof in the sciences, social sciences, and the humanities; strategies of argumentation; the effective consequences of word choice and sentence structure.

ED 1414 Current Issues in Teaching the Gifted and Talented 4 Q.H.

Students will examine issues that affect the type and quality of education available to the gifted and talented in the United States. Various approaches and programs will be described and evaluated, and conclusions will be reached about their effectiveness. Research findings on the needs of this segment of the population of learners will be examined in order to provide some criteria for future curriculum development.

ED 1415 Teaching Reading to Adolescents and Adults 4 Q.H.

For secondary education majors in the Boston Bouvé College of Human Development Professions who are preparing for teaching in the junior or senior high school. Emphasis is on language and symbolic process, word recognition, and meaning comprehension, and on methods and techniques of testing and grouping.

ED 1416 Supervised Field Placement: Early Childhood 2 Q.H.

A University-arranged institutional placement to allow students the opportunity to provide educational, remedial, and/or custodial services to children generally of ages two through five. Opportunity will be provided to analyze, develop, demonstrate, and evaluate skills and techniques in guiding the activities of children in nursery schools, day care centers, and/or kindergartens.

ED 1417 Student Teaching and Seminar 8 Q.H.

(Prereq. Formal acceptance into and completion of advanced professional sequence with minimum 2.0 q.p.a., both overall and in teaching major)

Full-time participation in a University-arranged and -supervised school program designed to provide opportunity for the analysis of learning and teaching and for the demonstration, evaluation, and development of teaching skills.

ED 1800 Directed Study 4 Q.H.

(Prereq. Permission of instructor)

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Preparation: Approval of the supervising faculty member and the Dean's Office of the Boston-Bouvé College of Human Development Professions. Approval forms must be submitted to the Dean's Office during the quarter prior to registration for the Directed Study.

ED 1801 Directed Study II 4 Q.H.

For students who have completed ED 1800.

INT 1330 Field Experience in Human Services I 4 Q.H.

Human services students are required to fulfill two fieldwork placements during the last two years of their program. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. Field experiences are supervised by University staff to maximize the student's learning opportunity.

INT 1331 Field Experiences in Human Services II 4 Q.H.

(Prereq. INT 1330 and junior or senior status, permission only)

Continuation of INT 1330.

Health, Sport, and Leisure Studies

HSL 1100 Beginning Swimming 1 Q.H.

Instruction in basic swimming skills for non-swimmers, with emphasis on personal water safety.

HSL 1101 Intermediate Swimming 1 Q.H.

(Prereq. HSL 1100 or equiv.)

Instruction in basic and advanced swimming skills, with emphasis on form and efficiency.

HSL 1103 Water Polo 1 Q.H.

(Prereq. HSL 1101 or equiv.)

Instruction in beginning water polo, with emphasis on personal skill, offensive and defensive team play.

HSL 1104 Advanced Life Saving 2 Q.H.

(Prereq. HSL 1101 or equiv.)

Instruction in Red Cross life-saving skills, techniques, and theory. Red Cross certification is possible.

HSL 1105 Water Safety Instructor 2 Q.H.

(Prereq. HSL 1101, HSL 1104)

Instruction in techniques, theory, and teaching methods in swimming and life-saving courses. Red Cross certification is possible.

HSL 1106 Beginning Scuba 2 Q.H.

(Prereq. HSL 1101 or equiv.)

Instruction in basic skin-diving and scuba-diving skills, with emphasis on personal safety.

HSL 1107 Small Crafts 1 Q.H.*

Introduction to basic skills in sailing.

HSL 1109 Beginning Gymnastics I 1 Q.H.

A coeducational approach to knowledge of and basic skills in floor exercise, vaulting, balance beam, parallel bars, uneven bars, high bar, and rings.

HSL 1110 Women's Gymnastics II 1 Q.H.

(Prereq. HSL 1109)

Focus is on knowledge and skill necessary in performing the beginning compulsory routines on the balance beam, floor exercise, uneven bars, and vaulting.

HSL 1111 Women's Gymnastics III 1 Q.H.

(Prereq. HSL 1110)

Skill and knowledge related to the performance of optional routines in the four areas of competitive women's gymnastics.

HSL 1112 Men's Gymnastics II 1 Q.H.

(Prereq. HSL 1109)

Skill and knowledge related to the performance of beginning compulsory routines on the high bar, side horse, rings, floor exercise, parallel bars, and vaulting horse.

HSL 1113 Men's Gymnastics III 1 Q.H.

(Prereq. HSL 1112)

Skill and knowledge related to performance in optional routines on the high bar, side horse, rings, floor exercise, parallel bars, and vaulting horse.

HSL 1114 Badminton 1 Q.H.

Instruction in basic badminton strokes, concepts, rules, strategies, and game play.

HSL 1115 Intermediate/Advanced Badminton

(Prereq. HSL 1114)

1 Q.H.

Instruction in badminton, including intermediate and advanced skills, with emphasis on singles and doubles match play and strategy.

HSL 1116 Tennis 1 Q.H.

Instruction in basic tennis strokes, concepts, rules, strategies, and game play.

HSL 1117 Intermediate/Advanced Tennis 1 Q.H.

(Prereq. HSL 1116 or equiv.)

Instruction in tennis, including intermediate and advanced skills, with emphasis on singles and doubles match play and strategy.

HSL 1118 Beginning Archery 1 Q.H.

Selected skills in target shooting and practical experience in archery games, novelty events, and conduct of tournaments.

HSL 1119 Beginning Bowling 1 Q.H.*

Focus is on development of knowledge and skill necessary for competent performance in bowling at the beginning level. Practice provided in nearby commercial alleys.

HSL 1120 Beginning Golf 1 Q.H.

Instruction in fundamental golf skills, knowledge of clubs and their use, and golf etiquette.

HSL 1121 Beginning Self-Defense 1 Q.H.

A survey of the principles and fundamental skills. Instruction is geared to the beginning and intermediate levels.

HSL 1122 Beginning Boxing 1 Q.H.

Instruction in boxing at the beginning level; emphasis on offensive and defensive techniques, scoring, training, and officiating.

HSL 1123 Beginning Wrestling 1 Q.H.*

Beginning level of instruction in basic wrestling maneuvers. Stress on fundamental breakdowns, escapes, takedowns, rides, and pinning combinations. Rules and scoring procedures discussed and modified matches conducted.

HSL 1124 Beginning Fencing 1 Q.H.

Instruction in basic foil fencing, including introduction to competition.

HSL 1125 Intermediate/Advanced Foil Fencing

(Prereq. HSL 1124 or equiv.)

1 Q.H.

Instruction in intermediate/advanced techniques of foil fencing, with special emphasis on competition, judging, and the use of electrical equipment.

HSL 1126 Karate 1 Q.H.

Fundamental techniques of unarmed combat for self-defense using the punches, kicks, and blocks of Tae Kwan Do/Karate.

*Lab fee required.

HSL 1127 Karate II (Prereq. HSL 1126) Continuation of HSL 1126, with progression to more complex techniques and combinations of punches, kicks, and blocks related to Tae Kwan Do/Karate.	1 Q.H.	HSL 1141 Intermediate/Advanced Basketball (Prereq. HSL 1140) Knowledge and skills appropriate for performance in basketball at the intermediate to advanced levels.	1 Q.H.
HSL 1128 Roller Skating Instruction for beginners in recreational roller-skating skills.	1 Q.H.	HSL 1142 Volleyball Knowledge and skills appropriate for playing volleyball at the beginning level.	1 Q.H.
HSL 1129 Beginning Ice Skating Instruction for beginners in recreational ice-skating skills.	1 Q.H.	HSL 1144 Field Hockey Knowledge and skills appropriate for playing field hockey at the beginning level.	1 Q.H.
HSL 1130 Figure Skating (Prereq. HSL 1129 or permission of instructor) Instruction in beginning and intermediate figure-skating skills.	1 Q.H.	HSL 1145 Football Fundamental skills and knowledge appropriate for beginning level performances in football.	1 Q.H.
HSL 1131 Yoga Introduction to yoga skills and techniques for men and women at the beginning level.	1 Q.H.	HSL 1146 Softball Knowledge and skill appropriate for performing in softball at the beginning level.	1 Q.H.
HSL 1132 Weight Training Introduction to the principles and use of resistive exercises: isotonic exercise (weights), isometric exercise, and the appropriateness of each.	1 Q.H.	HSL 1147 Baseball (Prereq. HSL 1146 or permission of instructor) Knowledge and skill appropriate for baseball at the intermediate and advanced levels.	1 Q.H.
HSL 1133 Physical Conditioning Instruction in assessing one's personal physical fitness level with emphasis placed on establishing a personal exercise regimen based upon scientific principles of training. Special sections will be designated which use different mediums of exercise, such as aerobic dance techniques, running, and circuit training.	1 Q.H.	HSL 1148 Women's Lacrosse Knowledge and skill appropriate for performance in lacrosse at the beginning level.	1 Q.H.
HSL 1134 Aerobic Exercise and Dance An introduction to fitness through aerobic exercise and dancing.	1 Q.H.	HSL 1149 Men's Lacrosse Knowledge and skill appropriate for performance in lacrosse at the beginning level.	1 Q.H.
HSL 1135 Yoga II (Prereq. Yoga I or equiv.) Refinement of poses learned in Yoga I (Iyengar style). Addition of more advanced standing and inverted poses, balances, and back bends.	1 Q.H.	HSL 1150 Soccer Knowledge and skill appropriate for performance in soccer at the beginning level.	1 Q.H.
HSL 1136 Beginning Handball Knowledge and skills appropriate to handball at the beginning level.	1 Q.H.	HSL 1151 Movement Education Concepts and techniques in movement education and exploration for elementary school educators.	1 Q.H.
HSL 1137 Beginning Cross-Country Skiing Instruction in the fundamental techniques of cross-country skiing.	1 Q.H.	HSL 1152 Folk and Square Dance Introduction to folk and square dance.	1 Q.H.
HSL 1138 Beginning Skiing The course offers instruction in fundamental techniques of downhill skiing.	1 Q.H.	HSL 1153 Modern Dance I Introduction to modern dance technique and style.	1 Q.H.
HSL 1139 Intermediate Skiing (Prereq. HSL 1138) The course provides instruction in downhill skiing, including intermediate and advanced techniques with emphasis on skill development.	1 Q.H.	HSL 1154 Modern Dance II (Prereq. HSL 1153 or equiv.) A continuation of HSL 1153 with progression to more complex modern dance techniques and combinations.	1 Q.H.
HSL 1140 Basketball Knowledge and skills appropriate for performance in basketball at the beginning level.	1 Q.H.	HSL 1155 Modern Dance III (Prereq. HSL 1154 or equiv.) A continuation of HSL 1154 with progression into the expressive and choreographic use of modern dance techniques.	1 Q.H.
		HSL 1156 Ballet I Introduction to ballet fundamentals with emphasis on alignment.	1 Q.H.
		HSL 1157 Ballet II (Prereq. HSL 1156 or equiv.) A continuation of HSL 1156 with emphasis on developing lyrical style.	1 Q.H.

HSL 1158 Ballet III 1 Q.H.

(Prereq. HSL 1165)

A continuation of HSL 1157 with emphasis on expanding the repertory of classical ballet movements.

HSL 1159 Jazz Dance I 1 Q.H.

Introduction to the fundamentals of jazz dance with emphasis on alignment.

HSL 1160 Jazz Dance II 1 Q.H.

(Prereq. HSL 1159 or equiv.)

A continuation of HSL 1159 with emphasis on developing jazz dance style.

HSL 1161 Jazz Dance III 1 Q.H.

(Prereq. HSL 1160 or equiv.)

A continuation of HSL 1160 with progression into more complex dance techniques and longer combinations.

HSL 1162 Rhythmic Analysis 1 Q.H.

(Prereq. Dance concentration or permission of instructor)

Analysis of rhythm as it applies to movement skills and dance.

HSL 1163 Ballroom Dance 1 Q.H.

An introduction to traditional and contemporary partner dancing.

HSL 1165 Dance Improvisation 1 Q.H.

(Prereq. HSL 1153, HSL 1156, or HSL 1159)

Practice in the use of dance as a medium for artistic expression. Emphasis on the development of skill in the use of improvisational techniques.

HSL 1167 Beginning Racquetball 1 Q.H.

Knowledge and skills appropriate for performance in racquetball at the beginning level.

HSL 1173 Beginning Track and Field 1 Q.H.

Instruction in the fundamental skills in the various track and field events.

HSL 1174 Intermediate/Advanced Track and Field

(Prereq. 62.16L or equiv.)

1 Q.H.
Instruction in intermediate/advanced techniques in track and field events. Emphasis is placed on improvement of individual skills; techniques of officiating are discussed.

HSL 1202 Recreational Sports Leadership 2 Q.H.

The exploration of teaching techniques involved in team, dual, and individual sports. Methods, such as the part-whole and whole-part, are presented and investigated to establish relevance to each of the sports areas under study. Students are given the opportunity to develop skills in planning units and individual lessons. In addition, students are expected to apply practical experience by teaching one lesson in each of the sports areas studied.

HSL 1205 Introduction to Winter Skills 1 Q.H.

Course investigates several winter sports, their origins and history, current population demands, and future trends. Various types of equipment and their use, as well as special health and safety considerations for winter sports, are discussed. Sports to be studied

include cross-country skiing, snowshoeing, skating, tobogganing, and snowmobiling.

HSL 1209 Basic Rockclimbing and Rappelling

2 Q.H.*

A training program designed to introduce potential rockclimbing leaders to all necessary facets of the sport. While successful completion of the program does not qualify a student to lead rockclimbing trips, it may help students to gain a better perspective of both the necessary skills and the leadership role in rockcraft. The program consists of a weekend of practical experience and two introductory discussion sessions at Bouvé. Program areas include activities and information regarding basic climbing and rappelling experience, knots, safety, delaying, equipment usage and care, and leadership. The lab fee includes lodging, meals, equipment use, and instruction.

HSL 1211 Analysis and Coaching of Softball

(Prereq. HSL 1146)

2 Q.H.

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate softball, including advanced skill analysis and management.

HSL 1212 Basic Canoeing

2 Q.H.

Instruction leading to an opportunity to qualify for Red Cross basic canoeing certification. Classes are held at the Warren Center and include theory and practical experience.

HSL 1220 Foundation of Leadership in Leisure Service 4 Q.H.

The course offers study of the basic principles of leadership relevant to the fundamentals of leadership in leisure services. Subjects include leadership styles, motivation, task sequencing, and evaluation.

HSL 1221 Introduction to Recreation and Leisure

3 Q.H.

The course provides an overview of the recreation and leisure service field with emphasis on history, scope, rationale, setting, programs and services, basic trends and issues, and future considerations. The course explores the basic elements of the recreation and leisure service field as they relate to society, the leisure profession, and the individual.

HSL 1222 Leisure Awareness and Leadership Camp

2 Q.H.**

One-week resident camp experience at the Warren Center, which emphasizes experiential learning, skill development, group processes and personal reflection. The purpose of the Leisure Awareness and Leadership Camp is to maintain the tradition upon which a philosophical foundation of leisure awareness and education is constructed. To be effective in a challenging recreation leadership role, one must first become aware of what these concepts mean personally and then concentrate on developing facilitation knowledge and skills. LALC enables students to

*Lab fee required.

**Resident fee required.

become aware of their leadership potential in the profession. Course is required and scheduled to be taken at the conclusion of the freshman year.

HSL 1223 Life/Career Planning 4 Q.H.

This course is designed to help students develop life/career planning skills for use in pursuit of a career in recreation and leisure studies. A variety of careers, co-op job opportunities, and lifestyles of professionals in the field are explored. Students are given the opportunity to assess their own interests, values, needs, and skills, and to develop job-finding skills, including résumé writing and interviewing techniques.

HSL 1250 Creative Dance I 2 Q.H.

(Prereq. HSL 1154 or HSL 1165)

Theory and practice of methods and materials in teaching creative dance to elementary school children. Examination of children's performance and appropriate teaching techniques with off-campus observation and experience. Designed to partially satisfy pre-practicum requirements for teacher certification at K-9 grade level.

HSL 1251 Creative Dance II 2 Q.H.

(Prereq. HSL 1154 or HSL 1165)

Theory and practice of methods and materials in teaching creative dance to secondary school youth. Examination of performance and teaching techniques with off-campus observation and experience. Designed to partially satisfy pre-practicum requirements for teacher certification at 5-12 grade level.

HSL 1252 Dance Composition I 3 Q.H.

(Prereq. HSL 1154 or permission of instructor)

Analysis of the basic dance choreographic elements—space, force, and time. Student solution of choreographic problems.

HSL 1253 Group Dynamics I 3 Q.H.*

An introduction to group dynamics through selected activities, discussion, and living and working together. A resident living experience for one week at the Warren Center is an integral part of the course.

HSL 1254 First Aid 2 Q.H.

Emergency care procedures recommended for the home, school, and community. Emphasis on practices endorsed by the American Red Cross.

HSL 1255 Human Movement 3 Q.H.

An introduction to the nature and role of human movement and the analysis of skillful movement performance through participation and observation. Introduction to the objectives, literature, and organization of the profession of physical education.

HSL 1256 Life/Career Planning 3 Q.H.

An examination and exploration of careers in physical education and related fields. The course provides an opportunity for students to assess personal skills and abilities, to research jobs of interest, and to practice specific career-planning skills.

HSL 1257 History and Philosophy of Physical Education 3 Q.H.

A survey of physical education from ancient times to the present. The influence of major philosophical positions upon the nature of physical education programs is analyzed.

HSL 1258 Elementary School Activities 3 Q.H.

Focus is on introductory knowledge and skills necessary for teaching physical education to elementary-school-aged children. Students are expected to learn about children's performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Course is designed to satisfy partially the pre-practicum requirements for teacher certification at the K-9 level.**

HSL 1259 Secondary School Activities 3 Q.H.

Physical activity appropriate for secondary school youth is studied in relation to their level of development and interest. Students are expected to learn about pupils' performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Course is designed to satisfy partially the pre-practicum requirements for teacher certification at the grades 5-12 level.**

HSL 1260 Perceptual-Motor Development 4 Q.H.

(Prereq. ED 1102 and ED 1103; may be taken concurrently)

Course offers a study of the development of motor skills from birth through infancy, early childhood, adolescence, and adulthood, including skilled performance of the aged. Age expectations for perceptual-motor behavior are considered, with a focus on a functional adequacy in skilled performance.

HSL 1261 Anatomy and Physiology I 4 Q.H.

Gross anatomy and physiology of the human skeletal, joint, nervous, and muscular systems.

HSL 1264 Adapted Physical Education I 4 Q.H.

(Prereq. HSL 1606, HSL 1261)

Survey of characteristics and attitudes pertaining to special-needs individuals, with particular emphasis on the effects of their presence on current physical activity programs. Observations of special-needs programs are included. Course is designed to satisfy partially pre-practicum requirements for teacher certification at the grade level K-12.

HSL 1265 Early Childhood Development 4 Q.H.

A study of the development of fundamental motor patterns (run, catch, kick, strike, jump, throw) from ages 0 to 5 years, including perceptual-motor relations operating in vision, audition, and proprioception.

HSL 1266 Physical Conditioning Programming 2 Q.H.

(Prereq. HSL 1133 and 1132)

Students will learn how to design and deliver instruction related to physical conditioning of the body.

**Teacher certification requirements available in 3 Dockser Hall.

*Lab fee required

HSL 1267 Methods and Materials in Teaching Folk, Square, and Ballroom Dance 1 Q.H.

(Prereq. HSL 1152 and 1134)

Theory and practice in the application of methods and materials for teaching folk, square, and ballroom dance.

HSL 1268 Basic Athletic Training Laboratory 1 Q.H.

(Prereq. concurrent with HSL 1605)

The biomechanical and anatomical principles as well as indications and contraindications for application of the various wrapping and strapping techniques involved with athletic injuries will be discussed. The indications for use and types of protective devices (braces, splints, etc.) will also be presented. Laboratory time for practical application and development of skills will be utilized.

HSL 1272 Dance Composition II 3 Q.H.

(Prereq. HSL 1160)

Analysis of the choreographic process including content, form, technique, and projection. Student solution of choreographic problems based upon literal and nonliteral themes.

HSL 1280 Foundations of Health Education 2 Q.H.

Provides opportunities for learners to investigate the broad spectrum of career possibilities in community and school health education and to ascertain their potential roles in the field. Philosophy of health education, the conceptual approach, and trends in health education are considered.

HSL 1281 Current Issues in Health 4 Q.H.

Focus is on the development of high-level wellness. Topics may include emotional health, nutrition, fitness, sexuality, drug use, disease, consumer issues, and environmental impacts. Emphasis is placed on the needs of the participants.

HSL 1282 Wellness 4 Q.H.

Experiential exploration of the concept of wellness, examining behaviors and lifestyle choices that lead to a high level of physical, emotional, and spiritual well-being. Issues include assessment of health risk, behavioral change, lifestyle analysis, the life cycle, and stress management through self-analysis.

HSL 1283 Introduction to Safety 2 Q.H.

Introduces the principles and fundamentals of safety education as they relate to people in their environment. Concerns safety as a social problem; considers major accident areas, accident causes, and liability; and analyzes possible solutions to accident problems.

HSL 1284 Instructional Resources 2 Q.H.

Introduction to the use of audiovisual media as educational tools. Production of slide presentations, transparencies, bulletin boards, displays, etc., is included. Opportunities are provided for experiences in operating selected equipment.

HSL 1285 Health Concerns for Youth 4 Q.H.

Application of health concepts to assist youth in

reaching a higher level of wellness through preventive measures. Significant health concerns are identified and dealt with as they relate to health professionals, teachers, and adults. Course is designed to satisfy partially the prepracticum requirements for teacher certification grade levels 5-12.

HSL 1286 Nutrition 4 Q.H.

This course offers the student the opportunity to learn and evaluate nutrition information both as a consumer and future educator. The chemical, biological, and physiological bases of nutrition are explained.

HSL 1300 Swimming Analysis 2 Q.H.

(Prereq. HSL 1101 or permission of instructor)

Instruction in theory, analysis techniques, and teaching methods in swimming.

HSL 1301 Analysis and Coaching of Men's Gymnastics 2 Q.H.

(Prereq. HSL 1113)

Skill analysis and coaching of men's gymnastics, with emphasis on appropriate teaching methods, new trends, and judging.

HSL 1302 Analysis and Coaching of Badminton 2 Q.H.

(Prereq. HSL 1115)

Analysis of performance and methods of teaching and coaching in badminton.

HSL 1303 Analysis and Coaching of Tennis 2 Q.H.

(Prereq. HSL 1117)

Analysis of performance and methods of teaching in tennis.

HSL 1304 Analysis and Coaching of Fencing 2 Q.H.

(Prereq. HSL 1125)

Advanced skill analysis and coaching of fencing. Special emphasis on current research and teaching methods.

HSL 1305 Analysis and Coaching of Golf 2 Q.H.*

(Prereq. HSL 1120 or equiv.)

Advanced skill analysis and coaching of golf. Special emphasis on course play and teaching methods.

HSL 1306 Analysis and Coaching of Track/Field 2 Q.H.

(Prereq. HSL 1135 or equiv.)

Advanced skill analysis and coaching techniques for selected track and field events. Special emphasis is placed on the analysis of common movement patterns, teaching methods, and coaching techniques.

HSL 1307 Analysis and Coaching of Wrestling 2 Q.H.

(Prereq. HSL 1123 or equiv.)

Analysis of performance and techniques of teaching selected wrestling skills are covered in detail. Application of research to methodology is stressed.

HSL 1308 Analysis and Coaching of Baseball 2 Q.H.

(Prereq. HSL 1147)

The basic techniques and responsibilities of coaching interscholastic and intercollegiate baseball, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

* Lab fee required.

HSL 1309 Analysis and Coaching of Basketball(Prereq. HSL 1140) **2 Q.H.**

The basic techniques and responsibilities of coaching interscholastic and intercollegiate basketball, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

HSL 1310 Analysis and Coaching of Field Hockey(Prereq. HSL 1144) **2 Q.H.**

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate field hockey, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

HSL 1311 Analysis and Coaching of Football(Prereq. HSL 1145) **2 Q.H.**

The basic techniques and responsibilities of coaching interscholastic and intercollegiate football, including advanced skill analysis, team conditioning, offensive and defensive systems, practice organization, team management, and coaching staff organization.

HSL 1312 Analysis and Coaching of Lacrosse(Prereq. HSL 1148 or HSL 1149) **2 Q.H.**

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate lacrosse, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

HSL 1313 Analysis and Coaching of Soccer(Prereq. HSL 1150) **2 Q.H.**

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate soccer, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

HSL 1314 Movement Fundamentals**1 Q.H.**

A course in posture and movement correctives. Focus is on both intellectual and experiential knowledge of the body and its potential for change.

HSL 1315 Analysis and Coaching of Volleyball**(Men-Women) 2 Q.H.**

(Prereq. HSL 1142)

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate volleyball, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

HSL 1316 Theory of Officiating**2 Q.H.**

Knowledge and skills in the basic concepts of officiating individual and team sports.

HSL 1317 Sports Officiating: Team Sports**2 Q.H.**

Theory, practice, and techniques of officiating in team sports such as basketball and volleyball.

HSL 1318 Sports Officiating: Individual Sports**2 Q.H.**

Theory, practice, and techniques of officiating individual sports such as tennis and badminton.

HSL 1319 Analysis and Coaching of Softball(Prereq. HSL 1146) **1 Q.H.**

Basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate softball, including advanced skill analysis and management.

HSL 1320 Analysis and Coaching of Women's**Gymnastics 2 Q.H.**

(Prereq. HSL 1111)

Skill analysis and coaching of women's gymnastics, with emphasis on appropriate teaching methods and new trends.

HSL 1321 Modern Dance IV**1 Q.H.**

(Prereq. HSL 1155 or equiv.)

A continuation of HSL 1155 with emphasis upon the application of modern dance technique and style in the performance of modern dance repertory.

HSL 1322 Ballet IV**1 Q.H.**

(Prereq. HSL 1158 or equiv.)

A continuation of HSL 1158 with in-depth study of the complicated variations derived from classical ballet. Emphasis on line and expressive interpretation.

HSL 1324 Jazz Dance IV**1 Q.H.**

(Prereq. HSL 1161 or equiv.)

A continuation of HSL 1161 with emphasis on style and expressive interpretation. Progression into the choreographic use of jazz dance.

HSL 1325, 1326, 1327 Dance Rehearsal and Performance I, II, III**(each) 1 Q.H.**

(Prereq. Permission of instructor)

Designed in order that students may develop skill in performance. Students may choreograph, stage, and perform an original work or perform in the original work of a guest or faculty choreographer.

HSL 1400 Group Dynamics**3 Q.H.**

The study of human behavior in groups is approached through lectures, reading, and structural group experiences. Major areas of concentration include communication, leadership, decision making, and evaluation of the group process.

HSL 1401 Program Planning in Recreation**4 Q.H.**

The course focuses on examination of program content, leadership, administration, and facilities associated with the effective delivery of leisure services under the auspices of public, private, religious, industrial, and voluntary agencies.

HSL 1402 Leisure and Lifestyles**4 Q.H.**

The course focuses on aspects contributing to lifestyles and the role of leisure. Specific lifestyles are examined through readings and video-taped movies. Students have the opportunity to examine the effect of leisure on their present lifestyles and future aspirations.

HSL 1403 Concepts of Leisure:**Sociopsychological Perspectives 4 Q.H.**

The course focuses on exploration of the various sociopsychological perspectives of leisure and the relations of mores, social structure, roles, values, and

personality to leisure expression. Investigation of other pertinent social and environmental factors that contribute to the phenomenon of leisure is included.

HSL 1406 Internship Seminar 1 Q.H.

Course offers preparation for professional field assignment in a leisure service setting. Focus is on identification and assessment of student career goals, analysis of previous volunteer and/or employment experience, professional involvement, and facilitation of the internship placement process.

HSL 1408 Research Methods 4 Q.H.

Study of basic statistics, the use of experimental and quasi-experimental design, sampling, instrumentation, data collection, and analysis as applied in recreation and leisure studies.

HSL 1409 Research Applications 4 Q.H.

The course examines the use of research methods in selected professional applications ranging from the ongoing research of departmental faculty to student-originated studies.

HSL 1410 Senior Seminar in Contemporary Issues and Trends in Recreation and Leisure

4 Q.H.

The course offers examination and discussion of contemporary issues and trends in the field of recreation and leisure. Focus is on critical aspects of leisure services: legislation, consumer advocacy, professional development, research, and innovations for the improvement of service delivery.

HSL 1420 Urban Recreation 4 Q.H.

The course provides an examination of the different cultural and sociological patterns of various ethnic groups who live in an urban setting. Various recreational activities are suggested for each group. Other pertinent recreational issues common to the urban community are studied.

HSL 1421 Management of Recreation and Physical Education Programs 4 Q.H.

The course focuses on management procedures of recreation and physical education facilities operations. Area and facility design, personnel policies, and problem solving related to administration and management is emphasized.

HSL 1422 Program Evaluation in Recreation 4 Q.H.

The course examines comprehensive systems for evaluating program effectiveness as it relates to the consumer of recreation services. Major emphasis placed on developing an evaluation system for an agency of the student choice. Case studies are drawn from the public, nonprofit, and commercial sectors.

HSL 1423 Commercial Recreation Marketing 4 Q.H.

Course offers an examination of commercial and private sector recreation services. Case studies workshops, and practical problems are related to managing leisure opportunities for resorts, country clubs,

theme parks, tourism, sports clubs, manufacturing and merchandising, and industrial recreation.

HSL 1425 Leisure and the Community School 4 Q.H.

The course provides exploration (through class lectures, discussions, readings, and on-site visitations) of the theoretical, operational, and motivating aspects of the community school concept. An opportunity to investigate the complex role played by leisure in the community school.

HSL 1426 Budget Analysis 4 Q.H.

The course focuses on the study and use of analytical techniques that can improve budgeting decisions. Topics include cost-effectiveness and benefit-cost analysis, efficiency measures, pricing, forecasting, and present-value analysis for solution of capital and operating budget problems in the nonprofit and commercial recreation sectors.

HSL 1427 Survey of Recreation Facilities 3 Q.H.

Study of fundamental management and administration concepts for a wide variety of outdoor areas and facilities such as parks, beaches, ice rinks, marinas, camps, and community centers.

HSL 1440 School Camping 3 Q.H.

(Prereq. HSL 1444 or permission of instructor)

Investigation of outdoor education as it applies to school camp organization, administration, program planning, and educational significance. Each student is required to participate in a one-week supervised practical experience at a designated school camp.

HSL 1441 Camp Administration 3 Q.H.

The course offers investigation of camp management guidelines including site development, health and safety, hiring and staff training, public relations, American Camping Association standards, legal regulations, organization within camps, programs, and other selected administrative aspects.

HSL 1442 Leadership and Organization of Wilderness Recreation 4 Q.H.

The course offers in-depth investigation of the leadership, organization, planning, implementation, and evaluation of outdoor pursuits. Particular emphasis is placed on multiday experiences in remote or wilderness setting. An extended outdoor practicum in a wilderness setting is required.

HSL 1443 Interpretation of Ecological and Social History 4 Q.H.

The course examines the employment of site visitations and problem-solving methods to investigate human interaction with and manipulation of the physical, biological, and social environment. The course provides the opportunity to acquire knowledge of ecosystem aspects which can be applied to environmental interpretation and decision-making sectors of ecosystem and recreation management.

HSL 1444 Environmental Education 4 Q.H.

The study of the philosophy and history of environmental education in political, social, and educational movements. Exploration of methods of developing, teaching, and evaluating environmental education curricula applicable to schools, camps, parks, and environmental centers.

HSL 1445 Seminar on Environmental Issues and Legislation 4 Q.H.

The course offers study of the development of attitudes toward the environmental and critical investigation of the history of the environmental movement. Investigation of current environmental issues and laws affecting our ecosystem and lifestyles through integrating theories from sociology, ecology, economics, and politics. Exploration of degrees of ecological and social constraints on future growth and definition of alternative futures.

HSL 1446 Elements of Outdoor Recreation Planning 4 Q.H.

The course offers exploration of the nature and significance of the outdoor recreation experience and how our natural resources can optimally meet people's needs. Focus is on the elements of outdoor recreation planning; identification, evaluation, assessment, and implementation. Relation of social groups, natural resources, and environmental concerns to outdoor recreation planning are included.

HSL 1460 Process of Aging 3 Q.H.

The course covers the study of phases of aging; discussion of the physical, social, and emotional changes and problems that face the aged; the study of types of services offered to senior citizens, and the sources of funds allocated to sponsor such services. The role of recreation and leisure programming are emphasized.

HSL 1461 Camping and Outdoor Education for the Handicapped 3 Q.H.

Innovations in outdoor learning with an emphasis on wellness, the American Indian, outdoor adventure activities, and a holistic perspective on the individual with a disability. Observations and practical applications are included.

HSL 1462 Leisure Counseling 4 Q.H.

This course provides students an opportunity to develop fundamental group counseling skills through the use of specialized strategies and traditional verbal counseling techniques. Major focus is on lifestyle awareness counseling.

HSL 1463 Overview of Physical Disabilities 4 Q.H.

The course offers a holistic and humanistic approach to people with physical disabilities including amputations, traumatic conditions, sensory impairments, neurological, orthopedic, and cardiovascular disorders. Rehabilitation procedures and treatment, adjunctive therapies, prosthetics, orthotics, assistive devices and techniques, and reentry into the community from

the individual, familial, and societal perspectives are discussed.

HSL 1464 Program Planning in Therapeutic Recreation 4 Q.H.

The course examines advanced planning of comprehensive therapeutic recreation services. Focus is on systems approach to planning for individuals and groups. Included are an intensive examination of the philosophy of therapeutic recreation; the study of the functional elements of activities, current legislation, and standards for service delivery.

HSL 1465 Therapeutic Recreation with Developmentally Disabled Persons 4 Q.H.

Course offers a review of major phases of normal growth and development for the purpose of understanding the causes and impact of developmental disabilities. Emphasizes role of play experiences in achieving sequentialized skills and concepts, practices and procedures employed in program design.

HSL 1466 Foundations of Psychiatric Services in Therapeutic Recreation 4 Q.H.

(Prereq. Permission of the instructor)

The course focuses on orientation to the foundations of mental health and variables affecting mental illness; examination of various psychiatric disorders and treatment modalities and the role of activity therapy in the treatment of mental illness; review of contemporary trends in psychiatry that pertain to therapeutic recreation.

HSL 1467 Social and Psychological Impacts of Illness and Disabilities 4 Q.H.

(Prereq. HSL 1463)

Exploration of relevant issues related to disability such as societal understanding of disability, handicapping conditions, adjustment, social networks, and the therapeutic use of self through a mixture of lectures, group discussion, guest speakers, and films. Examination of self in the role of change agents and care providers.

HSL 1470 Internship in Recreation and Leisure Services 12 Q.H.

Professional field assignment in leisure service settings designed to prepare students for professional career choices. Supervision by faculty, conferences with professional staff, and seminars. Ten-week internship.

HSL 1500 Mental Health 4 Q.H.

An investigation of emotional health and well-being as they relate to total health with emphasis on factors that influence emotional behavior. Various approaches to emotional health in public school programs are included.

HSL 1502 Communicable and Degenerative Diseases 4 Q.H.

The disease immunity process, with emphasis on prevalent communicable diseases in the United States today and their transmission; chronic diseases, cardiovascular diseases, cancer, diabetes, and other

constitutional and degenerative diseases and disorders that affect the nation's health. Predominant themes are personal health attitudes and behaviors. Personal health responsibility is analyzed.

HSL 1503 Human Sexuality and Family Dynamics

4 Q.H.

Sexuality from a physical, psychological, social, historical, and cultural perspective; needs and concerns about sexuality at various stages in life including a variety of approaches to sex education within schools, community, and the family.

HSL 1504 Longevity and Aging

4 Q.H.

Study of the biological, psychological, and sociological aspects of human aging. Consideration is given to the importance of one's current lifestyle in relation to the phenomenon of longevity and the quality of life.

HSL 1506 Evolving Patterns of Community Health Education

4 Q.H.

Principles of community health, with emphasis on contemporary local, national, and international organizations for meeting health problems; health care delivery, consumer health issues, environmental health, community resources, and the role of health education in the community.

HSL 1507 Seminar I

2 Q.H.

(Prereq. ED 1306)

An introduction to research and scientific writing, culminating in a research project in an area of special interest, is included.

HSL 1508 Seminar II

2 Q.H.

(Prereq. HSL 1507)

Discussion of current problems and new developments as they relate to health education in school and in a variety of community settings.

HSL 1509 Organization and Administration of Health Education Programs

4 Q.H.

Principles and methods of organization and administration of school and community health education programs; ethics, personnel, budget, facility management, and priorities.

HSL 1510 Health Counseling

4 Q.H.

The identification of physical, mental, emotional, and social health problems; remedial procedures; and counseling techniques to aid health educators to deal more effectively with various health problems.

HSL 1511 Independent Study I

1 Q.H.

HSL 1512 Independent Study II

2 Q.H.

HSL 1513 Independent Study III

3 Q.H.

HSL 1514 Independent Study IV

4 Q.H.

Designed to provide the student with an opportunity for concentrated planning and research. In-depth study may be carried out in a topic area of health, sport, or leisure. Outline of proposed study must be submitted.

HSL 1515 Public Health Administration

4 Q.H.

History and overview of public health agencies and the organization of services for meeting public health

needs at the local, state, federal, and international levels. Focus is on today's major health problems and services.

HSL 1516 Drug Use and Abuse

4 Q.H.

An exploration of the use and abuse of drugs in our society, including prescription and OTC drugs, alcohol, and smoking. Physiological, psychological, and sociological effects of drugs on humans are explored.

HSL 1517 Death, Bereavement and Suicide

4 Q.H.

An interdisciplinary approach to the contemporary issues involved in death and bereavement. Death is examined from a lifecycle approach, including the dynamics of grief and mourning. Suicide is examined as it relates to self-concept and stress.

HSL 1518 Community Health Assessment

4 Q.H.

Focus is on today's major community health problems, with an overview of the methods of assessment and evaluation of health needs at the local, state, federal, and international levels.

HSL 1520 Student Teaching

12 Q.H.

(Prereq. HSL 1585; HSL 1285; ED 1104)

Observation and practical teaching experience in public school health education programs. Supervision and evaluation by personnel, in cooperating schools and by Boston-Bouvé College of Human Development Professions faculty; seminars. Course is designed to satisfy partially the prepracticum requirements for teacher certification at grade levels 5–12.

HSL 1521 Field Experience

12 Q.H.

(Prereq. HSL 1585)

Observation and practical field experience in selected community health education settings. Supervision and evaluation by personnel, in cooperating schools and by Boston-Bouvé College of Human Development Professions faculty; seminars.

HSL 1585 Teaching Procedures/Curriculum in Health Education in School and Community

4 Q.H.

(Prereq. HSL 1285; ED 1104)

The prospective health educator is introduced to health education curriculum, techniques of planning, and pertinent methods and materials in school and community health education. Course is designed to satisfy partially the prepracticum requirements for teacher certification at grade levels 5–12.

HSL 1600 Psychology of Sport

2 Q.H.

(Prereq. P.E. or permission of instructor)

The psychological analysis of behavioral patterns and deviations of sports participants, including spectators and coaches. Emphasis on emotions, motivation, competition, and learning factors. Discussion of current sports highlights.

HSL 1601 Sociology of Sport and Dance

2 Q.H.

(Prereq. Permission of instructor)

The study of sport and dance as social institutions, including theories explaining the role of each in contemporary society and the part of each in evolving societies.

HSL 1602 Theory of Coaching**2 Q.H.**

An analysis of learning principles, sociology, and psychology as applied to coaching individual, dual, and team sports. Techniques and standards of squad recruitment, organization, leadership, and coaching ethics are presented.

HSL 1603 Theory of Play**2 Q.H.**

The nature of play and a study of cross-cultural patterns of play. An investigation of selected theories of play, including Huizinga, Caillois, Sutton-Smith, and Lee.

HSL 1604 Group Dynamics II**2 Q.H.***

(Prereq. HSL 1253)

Exposure to outdoor activities typical of outdoor adventure programs. Exposure to practices and philosophies of Project Adventure, Outward Bound, and national outdoor leadership schools, with an emphasis on skills teaching. Resident experience required.

HSL 1605 Basic Athletic Training**3 Q.H.**

The training and conditioning procedures in athletic programs; special emphasis on the prevention of athletic injuries; roles of the trainer, athlete, coach, and health service.

HSL 1606 Perceptual-Motor Learning**4 Q.H.**

(Prereq. PSY 1111 or equivalent)

A focus on the way information processing is involved in perceptual-motor learning and performance. Basic research data are applied to learning and executing skills in a variety of sports settings.

HSL 1607 Measurement and Evaluation**4 Q.H.**

(Prereq. ED 1307)

Construction, use, selection and interpretation of evaluative tools applicable to health, sport, and leisure studies; elementary statistical methods.

HSL 1608 Clinical Athletic Training**2 Q.H.**

(Prereq. HSL 1605)

The student athletic trainer's introduction to clinical experience with an opportunity to practice the various skills for evaluation and treatment of the injured athlete.

HSL 1609 Advanced Athletic Training**4 Q.H.**

(Prereq. HSL 1605)

The advanced preparation and utilization of conditioning programs and their administration for prevention and care of injuries associated with competitive athletics.

HSL 1610 Anatomy and Physiology II**4 Q.H.**

(Prereq. HSL 1261)

Gross anatomy and physiology of the human cardiovascular, respiratory, digestive, urinary, and endocrine systems. Metabolism, calorimetry, and other applied topics will also be covered.

HSL 1611 Kinesiology**4 Q.H.**

(Prereq. HSL 1261)

Science of human motion and anatomic and mechanical principles as they relate to an understanding of

skillful, efficient, and purposeful human motion. The internal and external forces acting upon a human body and the effects produced will be examined.

HSL 1612 Physiology of Exercise**4 Q.H.**

(Prereq. HSL 1610)

Study of the immediate and long-range effects of exercise upon the human body with emphasis on the cardiovascular and respiratory systems, muscles, and metabolism; physical fitness, body composition, and selected components of motor performance-assessment techniques and training principles. Introduction to indirect open-circuit calorimetry and EKG monitoring.

HSL 1613 Laboratory in Exercise Testing and Prescription**4 Q.H.**

(Prereq. HSL 1612)

Practicum in assessment of functional cardiovascular, muscular strength, muscular endurance, flexibility and body composition; prescription of exercise programs used to improve the above functions: volunteer work as an exercise test technician and exercise leader in a fitness class.

HSL 1614 Electrocardiography**4 Q.H.**

(Prereq. HSL 1612)

A study of basic and intermediate electrocardiography including cardiac function, lead systems, rate, rhythm, axis, infarction, ischemia, hypertrophy, effects of cardiovascular drugs, and effects of exercise.

HSL 1615 Critical Teaching Skills**4 Q.H.**

(Prereq. HSL 1258 or HSL 1259 and pre-practicum experience)

Course offers analysis of direct and indirect, verbal and nonverbal teaching methods for classroom and activity teaching, using techniques such as micro-teaching, peer teaching, and simulation. Techniques for measuring teacher behavior, such as interaction analysis, are studied and analyzed. A laboratory experience in an education setting is an essential activity.†

HSL 1616 Curriculum Development**3 Q.H.**

Course focuses on basic foundations of curriculum development stressing fundamental principles and guides to curriculum organization, format, and evaluation. Course material includes experience using the taxonomies of education objectives and survey of existing curricula and current curriculum trends.

HSL 1617 Administration of Physical Education**4 Q.H.**

The organization and administration of programs in physical education, with emphasis on elementary and secondary school programs.

HSL 1618 Exercise and Activities for the Older Adult**4 Q.H.**

Principles of physical activity and the organization of physical activity programs for the elderly in public and private agencies are studied. Research and practical applications of theory are required.

* Lab fee required.

† Designed to satisfy partially pre-practicum requirements for teacher certification.

HSL 1619 Adapted Physical Education II 4 Q.H.
(Prereq. HSL 1264)

Assessment, diagnostic, and prescriptive procedures in special-needs physical education programs. Emphasis is on modification techniques and integration of programming in accordance with legislative guidelines. Practicum experiences in special-needs settings are included.

HSL 1620 Comparative Physical Education 3 Q.H.
(Prereq. HSL 1257 or ED 1312)

Analysis of systems of physical education and sport in selected countries and their interrelations with the larger cultural framework.

HSL 1621 Dance in Cultural Perspective 4 Q.H.

A survey of dance from ancient times to 1900 with the focus on the evolution of dance as a theatre art.

HSL 1622 Supervised Field Experience 12 Q.H.
(Prereq. Senior status in major or permission of instructor)

Course offers assignment in a field setting related to the student's area of concentration within the curriculum, including observation and performance of professionally related skills under the guidance of a cooperating field professional and a college supervisor. To be taken by physical education majors who are not in a teacher certification program.

HSL 1623 Supervised Student Teaching (Practicum) 12 Q.H.

Course provides a minimum of at least 300 clock hours in an approved school, with clear instructional responsibilities for at least half of the time and full teaching responsibilities for a substantial period of time under the guidance of a certified cooperating teacher and college supervisor. The assignment must be at the level of teacher certification sought (K-9 or 5-12) and include coaching and/or intramural organization and supervision, evaluation conferences, and seminars. Students can prepare themselves for Certificate No. 30, Teacher of Physical Education, as granted by the Commonwealth of Massachusetts.†

HSL 1624 Student Athletic Training Internship (Permission of instructor) 6 Q.H.

This experience will give the senior student an opportunity to gain additional field experience and responsibility in athletic training at either a high school, college, or professional setting. It will fulfill the clinical internship requirement for graduation and will be in conjunction with any other senior year experience required by the specific majors.

HSL 1625 Senior Seminar 4 Q.H.
(Prereq. Permission of instructor)

Designed for senior students to discuss pertinent new topics and concepts in sports medicine.

HSL 1626 Therapeutic Reconditioning for Athletic Training 4 Q.H.

(Prereq. HSL 1627)

Principles and objectives inherent in the rehabilitation process of athletic injuries. Basic rehabilitation fundamentals, as well as specific conditioning and reconditioning techniques utilized will be discussed. The student will be exposed to the different types of exercise, as well as the different rehabilitative equipment used in a rehabilitation program. Laboratory experiences in the application of exercise programs and use of equipment will be provided.

HSL 1627 Therapeutic Modalities for Athletic Training 4 Q.H.

(Prereq. HSL 1605)

Physical agents used in athletic training are presented with regards to their physiological effects, where in the healing process they may be used, and all indications and contraindications for use. Laboratory experiences in application of those physical agents will be utilized.

HSL 1630 Aspects of Dance 3 Q.H.

An introduction to dance forms, functions, and styles. Analysis of dance as an art and an overview of dance professions. Lectures, lab, and attendance at performances.

HSL 1632 Dance in the Twentieth Century 4 Q.H.
(Prereq. HSL 1621)

A survey of dance in the twentieth century. The focus of the course is on the emergence and development of modern dance and the impact of twentieth-century choreographers upon the classical ballet tradition. Slides and films will be used to illustrate the choreographic innovations of artists such as Martha Graham, Alwin Nikolais, Twyla Tharp, Fokine, Balanchine, Bejart.

HSL 1634 Laban Movement Analysis 2 Q.H.

Introduction to Laban's qualitative system of movement description and behavior. Emphasis is on the study of effort, shape, and space harmony.

HSL 1863 TAC - Special Problems 2 Q.H.

(Prereq. Permission of instructor)

Designed as directed study in analysis and coaching of a sport or activity not offered by the department or in special scheduling situations.

HSL 1866 Special Problems 4 Q.H.

(Prereq. Permission of instructor)

The course focuses on independent investigation in an area of each student's interests. The investigation will be supervised by an appointed faculty member and will culminate in a formal written report.†

†Teacher certification requirements available in 3 Dockser Hall.

Physical Therapy

PTH 1114 Introduction to Physical Therapy I 2 Q.H.

The course provides orientation to the field of physical therapy and its role in the health professions; theory and practice in applied body mechanics and basic procedures related to patient management.

PTH 1115 Introduction to Physical Therapy II 2 Q.H.

The course provides practice in the preparation of patients and equipment for various treatment procedures. Theory demonstration and practice in heat, light, and hydrotherapy.

PTH 1310 Clinical Gross Anatomy 6 Q.H.*

(Prereq. BIO 1254 and BIO 1255)
The course regionally covers the structure and function of the human body, with particular emphasis on the skeletal, muscular, nervous, and vascular components of each region. It involves lectures, cadaver prosection, osteology laboratories, and surface anatomy palpation to investigate basic human anatomy and the clinical applications of anatomy.

PTH 1315 Physiology for Physical Therapists 5 Q.H.

(Prereq. BIO 1254, BIO 1255, and PTH 1115)
The course covers neuromuscular, cardiovascular, and respiratory physiology applied to physical therapy.

PTH 1320 Physical Therapy I 2 Q.H.

(Prereq. BIO 1255, PTH 1115, and BIO 1254)
Course offers theory, demonstrations, and practice in massage integrated with other treatment procedures; and anatomical and physiological theory and principles. Problem-solving and case analyses are utilized.

PTH 1325 Clinical Medicine I 4 Q.H.

(Prereq. BIO 1254 and BIO 1255)
The course covers general medicine, laboratory medicine, and pathology as related to conditions commonly treated by physical therapists.

PTH 1330 Clinical Kinesiology 5 Q.H.*

(Prereq. PTH 1310 and PTH 1315)
The course involves the study of normal movement through analysis of muscle and joint function. Clinical applications also given for pathological movement.

PTH 1335 Physical Therapy II 3 Q.H.

(Prereq. PTH 1310, PTH 1315, and PTH 1320)
The course covers evaluation procedures: theory, demonstration, practice, and planning.

PTH 1340 Physical Therapy III 4 Q.H.

(Prereq. PTH 1114, PTH 1115, PTH 1310, PTH 1315, PTH 1320)
This course covers basic therapeutic exercise: theory, demonstration practice, and planning.

PTH 1345 Clinical Medicine II 3 Q.H.

(Prereq. PTH 1310, PTH 1315, and PTH 1325)
Orthopedic conditions and their medical, surgical, and physical therapy treatment.

PTH 1352 Psychosocial Aspects of Illness 3 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)
The course examines interpersonal relationships among patients, families, health professionals, and society, with reference to the impact of and reaction to illness.

PTH 1355 Physical Therapy IV 3 Q.H.

(Prereq. PTH 1315, PTH 1330, PTH 1335, PTH 1340, and PTH 1345)
Course covers theory, demonstration, and practice in prosthetics, orthotics, and advanced functional training of spinal-cord-injured patients.

PTH 1360 Physical Therapy V 4 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)
Theoretical basis and clinical application of the neurophysiological approaches to treatment: Brunnstrom, Rood, and proprioceptive neuromuscular facilitation techniques.

PTH 1366 Neuroanatomy 5 Q.H.*

(Prereq. PTH 1340)
Morphology and function of the human nervous system. Abnormalities of structure and function of the nervous system. Lecture and laboratory.

PTH 1370 Clinical Seminar 2 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)
Selected topics related to clinical aspects in physical therapy. Interpersonal relationships, ethics, teaching-learning process, communication, group dynamics, medical-legal issues, sociocultural/socioeconomic considerations, and clinical education information.

PTH 1375 Physical Therapy VII 2 Q.H.

(Prereq. PTH 1335, PTH 1345, and PTH 1365)
The course covers theory, demonstration, and practice in electrical testing and treatment procedures.

PTH 1380 Supervised Clinical Education I 5 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)
An introduction to clinical experience providing the student with opportunities to practice various skills in the evaluation and treatment of patients under supervision. Five weeks during Quarter 9 of the junior year in Massachusetts.

PTH 1385 Clinical Medicine III 3 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)
The course focus is the pediatric and neurologic aspects of physical therapy practice, including review of symptoms and conditions and therapeutic intervention.

*Including lab.

PTH 1390 Physical Therapy VI 3 Q.H.
(Prereq. PTH 1315, PTH 1330, PTH 1335, and PTH 1340)

Respiratory physical therapy; theory, demonstration, and practice in the management of medical and surgical chest conditions. Introduction to respiratory mechanical equipment and cardiopulmonary resuscitation.

PTH 1395 Physical Therapy V (PTH 1360 continued) 1 Q.H.

(Prereq. PTH 1330, PTH 1335, PTH 1340, and PTH 1345)

Topics include neurodevelopmental treatment, neurophysiological theory, and clinical application of facilitation and inhibition techniques to enhance motor control as advocated by the Bobaths.

PTH 1400 Administration 4 Q.H.
(Prereq. PTH 1380)

Concepts in administration and management applied to physical therapy. (Seminar and discussion groups.)

PTH 1405 Research for Physical Therapy 4 Q.H.
(Prereq. Satisfactory attainment in all prior professional courses)

The course covers introduction to research design, basic statistics, analysis of scientific and medical literature, and preparation of an independent research proposal.

PTH 1411 Physical Therapy VIII 4 Q.H.
(Prereq. Satisfactory attainment in all prior professional courses)

The course incorporates analysis and comparison of methods of physical therapy evaluation and treatment, with an emphasis on therapeutic exercise, and treatment planning for various problems with emphasis on rationale and selection of treatment alternatives. Case study format and case simulations are used. The course meets for three lecture hours. The third is in seminar format with small group discussions.

PTH 1415 Supervised Clinical Education II 0 Q.H.
(Prereq. Satisfactory attainment in all prior professional courses)

Advanced clinical education providing the student with further opportunities to practice various phases of physical therapy under supervision in preparation for assuming the role of a qualified physical therapist. Assignments in Massachusetts and other states. Twelve weeks during senior year. Required for graduation from the physical therapy program.

PTH 1420 Physical Therapy in the Health Care System 3 Q.H.

(Prereq. PTH 1370 and PTH 1380)

This course examines major issues impacting the delivery of health care. Emphasis is on the role of the physical therapist as a member of the health team. Class discussion and seminar.

PTH 1426 Functional Assessment of the Elderly Client 3 Q.H.

(Prereq. PTH 1370 and PTH 1380)

The interaction of psychological, social and physiological factors and their effect on the potential for function of the elderly client are discussed in this course. Assessment instruments will be studied and designed.

PTH 1450 Investigative Studies 6 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)

The course covers selected modules related to current practice in physical therapy; completion of research project on a volitional basis.

PTH 1800 Directed Study 2 Q.H.

(Prereq. Permission of Instructor, Chairperson, and Dean)

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in the basic, entry-level curriculum of the Department of Physical Therapy.

Speech-Language Pathology and Audiology

SLA 1100 Basic Manual Communication Systems 4 Q.H.

Course focuses on the use of manual communication systems in deaf education (Manual English, SEE, and Signed English). Discussions will cover the goals and assumptions underlying these systems, their relation to American Sign Language and English, and the application of these systems in educational and clinical settings. Instruction is provided in introductory level English Sign Language.

SLA 1101 Introduction to Speech and Hearing 4 Q.H.

Course offers an overview of disorders of speech and hearing and their treatment, and a review of normal speech and hearing development. Clinical

observations of persons with speech, language, and hearing disorders are required.

SLA 1200 Hearing Science 4 Q.H.
(Prereq. SLA 1101)

Basic concepts related to the physics of sound are presented, followed by an in-depth study of the anatomy and physiology of the normal hearing mechanism. In addition, basic principles of psychophysics of audition are discussed.

SLA 1201 Anatomy and Physiology of Vocal Mechanisms 4 Q.H.

(Prereq. SLA 1101)

Course offers an in-depth study of the static structure, musculature, and physiology of the speech

mechanism. Current research in speech physiology is emphasized.

SLA 1300 Developmental Semantics and Syntax (Prereq. SLA 1101) **4 Q.H.**

Course provides an analysis of the emerging semantic and syntactical aspects of language in normal and atypical children, with emphasis on discussion of current theory and research in language acquisition. Clinical observations of children with normal and atypical language patterns are required.

SLA 1301 Phonetics and Developmental Phonology (Prereq. SLA 1101 and SLA 1201) **4 Q.H.**

Course offers a basic training in auditory recognition and symbolization of phonemes and allophones in major American dialects. Static and dynamic articulatory descriptions are stressed. Course also includes a review of the developmental sequence of phonemic acquisition.

SLA 1302 Phonemic Disorders **4 Q.H.** (Prereq. SLA 1201, SLA 1300, and SLA 1301)

Course provides a practical and theoretical examination of the phonemic disorders and their etiology; diagnostic tools for evaluation and methods of treatment. Clinical observations of persons with phonemic disorders are required.

SLA 1303 Introduction to Audiology **4 Q.H.** (Prereq. SLA 1200)

Course focuses on the basic techniques of audiometric testing and hearing conservation, including a review of basic hearing sciences and a pre-practicum and lab experience in hearing testing.

SLA 1400 Speech Science **4 Q.H.** (Prereq. SLA 1101 and SLA 1200)

Course offers an examination of the basic sciences involved in speech and audition, including in-depth study of the analysis of sound and the acoustic composition of speech. Emphasis is placed on a review of current theory and research in speech reception, perception, and production.

SLA 1401 Fluency Disorders **4 Q.H.** (Prereq. SLA 1201)

Course offers a comprehensive study of the various theories and symptomatologies of stuttering from the earliest historical references through the nineteenth and twentieth centuries. Clinical observations are required.

SLA 1402 Diagnostic Techniques **4 Q.H.** (Prereq. SLA 1300, SLA 1301, SLA 1302)

Course offers a presentation and review of diagnostic tests and procedures in speech-language pathology. Emphasis is on the parent interview; the oral examination; and the appraisal of phonemic, phonatory, language, fluency, and auditory disorders. Observations of diagnostic evaluations are required.

SLA 1403 Orientation to Clinical Practices **4 Q.H.** (Prereq. Senior status)

This is a pre-practicum course designed to introduce students to the policies of ASHA; to offer exposure to related health professions; to discuss the influence of state and federal legislation upon the delivery of speech-language and hearing services; to examine the role of the clinical supervisor; and to practice writing clinical goals and lesson plans.

SLA 1404 Introduction to Psychoacoustics **4 Q.H.** (Prereq. SLA 1400 or SLA 1200 or SLA 1303)

This course explores the physics of sound and the psychological aspects of hearing with an emphasis on clinical applications. Topics include threshold, loudness, pitch, adaption, and auditory localization. The prerequisite may be waived only with permission of the instructor.

SLA 1500 Psychoacoustics Laboratory **4 Q.H.** (Prereq. SLA 1404)

This course provides practical application of topics discussed in SLA 1404. Students are required to re-create some of the most interesting of the classical psychoacoustics experiments. The prerequisite may be waived only with permission of the instructor.

SLA 1501 Clinical Practice and Seminar **4 Q.H.** (Prereq. SLA 1403)

Course provides full-time participation in a University-arranged and supervised school program designed to provide the student with initial involvement in the clinician-client relationship and an opportunity to demonstrate, evaluate, and develop clinical skills.

SLA 1800 Directed Study **4 Q.H.** (Prereq. Permission of instructor)

This course is provided for the student whose unique academic needs or interests cannot adequately be satisfied in any of the scheduled courses of the department. Preparation: Approval of the supervising faculty member, chairperson, and the Dean's Office of the Boston-Bouvé College of Human Development Professions. Approval forms must be submitted to the Dean's Office during the quarter prior to registration for the Directed Study.

Pharmacy

PAH 1135 Professional Dynamics in the Health Care Delivery System 4 Q.H.

An examination of the evolution of the American health care delivery system with emphasis on current aspects of how health care is delivered, how it is financed, where it is delivered, and who delivers it. Present and future influences in health will be discussed. Introduction to unique and collective health professional roles and responsibilities, humanistic/behavioral dimensions of health care, professional organizations, and professionalism.

PAH 1202 Anatomy-Physiology I 5 Q.H.*

(Prereq. CHM 1122 and BIO 1107)

This course covers structure and function of cells, tissues, and organs, including the muscular, immune, and nervous systems. The laboratory includes human skeletal anatomy and cat dissection. Both the lecture and laboratory sections of this course are oriented to students in the health professions.

PAH 1204 Anatomy-Physiology II 5 Q.H.*

(Prereq. PAH 1202 or permission of instructor)

The course covers structure and function of the various life-supportive systems not covered in the first quarter: cardiovascular, endocrine, gastrointestinal, pulmonary systems. Laboratory is devoted to basic principles involved in understanding the functioning life systems and cell function.

PAH 1280 Biochemistry 4 Q.H.

This introductory course in biochemistry deals with the structures, functions, and metabolism of amino acids, proteins, carbohydrates, lipids, and nucleic acids. Mechanisms of enzyme reactions, enzyme kinetics, vitamins, biological oxidation reduction reactions, and bioenergetics are discussed, as well as various inborn errors of metabolism.

PCL 1101 Drugs — Their Uses and Actions 4 Q.H.

Topics include background, classification, dose responses, untoward side effects, uses, and commercial preparations of a broad series of drugs. (Not open to pharmacy, respiratory therapy, or nursing majors).

PCL 1301 Basic Pharmacology 3 Q.H.

(Prereq. Permission of instructor)

This course provides students an opportunity to learn the classification, mechanisms of action, and uses of a broad spectrum of therapeutic agents. Dose response and untoward side effects are emphasized.

PCL 1305 Pharmacodynamics 3 Q.H.

(Prereq. BIO 1120, BIO 1255, CHM 1111, and CHM 1112)

This course provides introductory expositions of pharmacologic principles, with the pharmacotherapeutics of drug groups and individual drug substances of particular importance in treatment and diagnosis of disease.

PCL 1309 Pharmacology for the Respiratory Care Practitioner 4 Q.H.

The course provides an orientation to pharmacology, including the scope of pharmacology; definitions; drug standards; drug legislation; names, sources, and active constituents; and pharmaceutical preparations of drugs relating to the respiratory-care practitioner.

PCL 1410 Introduction to Pathology 4 Q.H.

(Prereq. PAH 1202 and PAH 1204)

The course focuses on basic concepts of pathology for the pharmacy, toxicology, and respiratory therapy majors, with emphasis on disease processes and alterations of normal biochemical mechanisms.

PCL 1420 Pharmacology/Medicinal Chemistry II 6 Q.H.

(Prereq. PMC 1418)

Continuation of PMC 1418. An interdisciplinary approach to the fundamental chemical and pharmacological principles of drug action. A discussion of structure-activity relationship, absorption characteristics, metabolic fate, pharmacodynamics, and therapeutic application, principally of those drugs acting at autonomic and cardiomuscular sites.

PCL 1422 Pharmacology/Medicinal Chemistry III 6 Q.H.

(Prereq. PCL 1420)

A continuation of PCL 1420 with special emphasis on drugs affecting the hematopoietic systems, the kidneys, and the endocrine and reproductive systems.

PCL 1450 Pharmacology Laboratory I 1 Q.H.*

(Prereq. PMC 1418)

Qualitative effects of drugs are systematically observed. Characteristic signs and symptoms related to mechanisms of action of drugs are compared and identified using the "Hippocratic Screen" method.

PCL 1452 Pharmacology Laboratory II 1 Q.H.*

(Prereq. PMC 1418)

Quantitative aspects of drug-dose response are observed. Methods of measurement of response and the pharmacodynamic, pharmacokinetic, and physiological factors affecting drug-dose response and their measurement are covered.

PCL 1505 Drug Interactions 4 Q.H.

The basic chemical-physical, pharmacodynamics, pharmacokinetic, physiological, and pathological factors associated with drug interactions are studied. The roles of these factors in the efficacy and safety of therapeutic drug regimens involving major pharmacological classes of drugs are discussed.

PCL 1801 Special Research Project (Pharmacology) (each) 4 Q.H.*

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest.

* Lab fee required.

PCL 1802 Special Research Project**(Pharmacology)****4 Q.H.***

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest.

PCL 1803 Special Research Project**(Pharmacology)****4 Q.H.***

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest.

PCT 1230 Pharmaceutical Calculations**3 Q.H.**

The course provides an introduction to the general scope of pharmacy. Emphasis is on systems of measurement and basic arithmetic calculations as they relate to the practice of pharmacy. Additionally, the student is introduced to statistical analysis and essential mathematical concepts required for subsequent courses in pharmaceuticals.

PCT 1310 Pharmaceutics Laboratory I**1 Q.H.**

(Prereq. PCT 1340 or concurrent enrollment)

The course focuses on the physicochemical principles of pharmaceutical preparations and their relationship to quality control and biopharmaceutics and pharmacokinetics.

PCT 1320 Pharmaceutics Laboratory**2 Q.H.**

(Prereq. PCT 1350 or concurrent enrollment)

The course focuses on the application of the fundamental principles and techniques of pharmaceutics to the laboratory preparation and use of various pharmaceutical drug products.

PCT 1340 Pharmaceutics I**4 Q.H.**

(Prereq. MTH 1108, PHY 1203, CHM 1265, and PCT 1230)

The course focuses on the study of physiochemical theories and principles and their application to pharmaceutical systems. Topics include thermodynamics, ionic equilibria, solubility, complexation, interfacial phenomena, rheology, coarse dispersions, diffusion, membrane transport, and kinetics.

PCT 1350 Pharmaceutics II**5 Q.H.**

(Prereq. PCT 1340)

The course focuses on the application of the fundamental principles of physical pharmacy to the formulation of pharmaceutical preparations. Emphasis is on pharmaceutical dosage forms, including both industrial formulation and extemporaneous compounding.

PCT 1440 Biopharmaceutics/Pharmacokinetics

(Prereq. PAH 1204)

4 Q.H.

A class designed to acquaint students with biopharmaceutics and basic pharmacokinetics. Topics include dissolution, disintegration, general concept of one- and two-compartment models; linear and non-linear pharmacokinetics; drug kinetics after intravenous, intramuscular, or oral administration; practical

methods of one-compartment model utilizing urinary data; bioavailability; multiple-dosing kinetics; and general approaches to dosage adjustment in disease states.

PCT 1441 Pharmacokinetic Principles in Drug Therapy**4 Q.H.**

(Prereq. PCT 1440)

The course covers the monitoring, development, and modification of drug dosage regimens, and the pharmacokinetic factors influencing the selection of these regimens, for the various therapeutic categories of drugs.

PCT 1801 Pharmaceutics Special Research Project**4 Q.H.***

(Prereq. Permission of instructor(s) and program director)

A course of directed study or research in one of the pharmaceutical sciences, wherein the student may undertake in-depth investigation of an area of specialized interest.

PCT 1802 Pharmaceutics Special Research Projects (each)**4 Q.H.***

(Prereq. Permission of instructor(s) and program director)

A course of directed study or research in pharmaceuticals, wherein the student may undertake in-depth investigation of an area of specialized interest.

PCT 1803 Pharmaceutics Special Research Project**4 Q.H.***

(Prereq. Permission of instructor(s) and program director)

A course of directed study or research in pharmaceuticals, wherein the student may undertake in-depth investigation of an area of specialized interest.

PHP 1301 Pharmaceutical Jurisprudence**4 Q.H.**

(Prereq. Permission of instructor)

The course offers a comprehensive analysis and interpretation of laws relating to the practice of pharmacy. Federal and state food and drug laws, narcotics laws, Medicare and Medicaid regulations, and state pharmacy laws are discussed.

PHP 1302 Pharmacy Administration I**4 Q.H.**

(Prereq. Permission of instructor)

The course covers socioeconomic aspects of pharmacy: the government's relation to the pharmaceutical industry, trends in contemporary practice, third-party payment plans, macroeconomic impact on the industry, and the interaction of current concepts in pharmacy.

PHP 1303 Interpersonal Skills for Health Professionals**4 Q.H.**

The course is designed to apply the skills of interpersonal communication to situations encountered in various health care settings. Students are provided with an opportunity to learn to integrate specific technical competence with serious concern for personal, social, and cultural factors in illness and health care.

*Lab fee required.

Through the use of medical sociology literature, audio-visual materials, case analyses, and personal reflection on actual patient encounters, the students are provided with an opportunity to improve interpersonal communication skills, and to help increase their understanding of practitioner-patient relationships, patient's needs and responses in illness and treatment, and professional behavior in practice settings.

PHP 1304 Social Pharmacology 4 Q.H.

(Prereq. PHP 1303 or consent of instructor)

An introductory study of drug-taking experiences and behaviors. The course provides an overview of theories and research findings which describe the relationships between personal, social, and cultural factors and drug taking, while comparing and contrasting the social approach with the pharmacological paradigm of drug effects and the medical model of drug use. Through the use of readings, audiovisual materials, and descriptions of personal experiences, the student will examine the varieties of drug experiences, patterns of and reasons for drug taking of all types, and strategies for preventing drug use problems.

PHP 1305 Hospital Pharmacy Management 4 Q.H.

(Prereq. Senior standing or permission of instructor)

The factors involved in the operations and management of a hospital pharmacy within the context of the total hospital structure.

PHP 1306 Community Pharmacy Management 4 Q.H.

(Prereq. Senior standing or permission of instructor)

The course focuses on the management requirements for establishing a community pharmacy. A comparative analysis of the prevailing types of organizations, locations, leases, business organization, staffing, plant layout and design, and financial factors.

PHP 1307 Principles of Management 4 Q.H.

(Prereq. Permission of instructor)

The course covers the fundamentals of business organization with emphasis on the qualitative and legal aspects of management. This course includes an analysis of the marketing structure of the drug trade, forces of organizations, personnel management, and decision-making theory using nonqualitative data.

PHP 1308 Financial Management 4 Q.H.

(Prereq. Permission of instructor)

The course examines the fundamentals of accounting and finance with emphasis on their application to retailing and community pharmacy management. Accounting systems, analysis of financial statements, budgets, cash flow, taxation, and finance are covered in depth.

PHP 1309 Seminar in Community Pharmacy Management 4 Q.H.

(Prereq. Permission of instructor)

A discussion course on all phases of community pharmacy operations with extensive utilization of the case method of instruction.

PHP 1401 Drug Information and Evaluation 3 Q.H.

(Prereq. Fifth-year standing or permission of instructor)

An introduction to the principles and practice of drug information. Material covered includes the levels of practice, the availability of therapeutic reference sources, the use of abstracting and indexing systems, how to respond to drug information questions, and basic statistical data required to help understand the medical and pharmaceutical literature.

PHP 1402 Parapharmaceuticals 2 Q.H.

Course focuses on the nature and application of various surgical devices, appliances, bandages, and hospital and sickroom supplies in patient care.

PHP 1501 Pharmacy Externship 4 Q.H.

(Prereq. Fifth-year standing)

A 520-hour (thirteen weeks x 40 hours/week) structured practicum in community pharmacy. The experience includes applied aspects of community pharmacy management; medication dispensing; and patient-oriented services such as prescription and nonprescription medication, consultation, and patient-profile monitoring.

PHP 1502 Clinical Pharmacy Clerkship 15 Q.H.

(Prereq. PHP 1602)

Students are assigned to a clinical site for five full days per week to observe patient response to medication and to evaluate and advise on all factors that may modify efficacy, safety, and economy of therapy. Campus seminar involves student presentations on current therapeutic topic.

PHP 1503 Professional Practice Laboratory 1 Q.H.

(Prereq. Senior standing or permission of instructor)

Compounding and dispensing medications. Emphasis is on patient counseling techniques and monitoring for appropriateness of therapy. Prescription compounding involves screening for incompatibilities. Also includes an introduction to the preparation of intravenous solutions.

PHP 1601 Nonprescription Medication 4 Q.H.

A course designed to provide an overall view of the various types of "over-the-counter" medications. The directions and precautions for proper use of these preparations are discussed.

PHP 1602 Pharmacotherapeutics 5 Q.H.

(Prereq. PCL 1422 and PCL 1410)

The course covers discussion of common clinical laboratory tests, major disease states, and drug therapy for these conditions.

PHP 1603 Selected Topics in Clinical Pharmacy I 4 Q.H.

(Prereq. PHP 1602 and permission of instructor)

Designed to help students increase their understanding of selected diseases. Pathophysiology and diagnosis of the illness as well as drug therapy and its relation to patient compliance and education. Provides greater depth than existing clinical pharmacy courses.

PHP 1604 Selected Topics in Clinical Pharmacy II 4 Q.H.

(Prereq. PHP 1602 and permission of instructor)
This is a course designed to help increase the student's knowledge of selected disease entities. Topics will include pathophysiology and diagnosis of the illness as well as drug therapy and its relation to patient compliance and education. Provides greater depth than existing clinical pharmacy courses.

PHP 1801 Special Research Project 4 Q.H.
(Clinical Pharmacy)

(Prereq. Permission of instructor and program director)
This is a course of directed study or research in clinical pharmacy, wherein the student may undertake in-depth investigation of an area of specialized interest.

PHP 1802 Special Research Project 4 Q.H.
(Clinical Pharmacy)

(Prereq. Permission of instructor and program director)
This is a course of directed study or research in clinical pharmacy, wherein the student may undertake in-depth investigation of an area of specialized interest.

PHP 1803 Special Research Project 4 Q.H.
(Pharmacy Administration)

(Prereq. Permission of instructor and program director)
This is a course of directed study or research in pharmacy administration, wherein the student may undertake in-depth investigation of an area of specialized interest.

PHP 1804 Special Research Project 4 Q.H.
(Pharmacy Administration)

(Prereq. Permission of instructor and program director)
This is a course of directed study or research in pharmacy administration, wherein the student may undertake in-depth investigation of an area of specialized interest.

PMC 1418 Medicinal Chemistry/Pharmacology I 4 Q.H.

(Prereq. BIO 1107, CHM 1265, PAH 1202, PAH 1204)
Course offers an introduction to the principles of pharmacology and medicinal chemistry applied to the discovery of drugs and their therapeutic utility in man. The course provides greater detailed discussion of drugs affecting the central nervous system, including therapeutic indications, adverse reactions, and mechanisms of action.

PMC 1440 Medicine Out of the Earth 4 Q.H.
(Prereq. CHM 1265, BIO 1106 and BIO 1107)

This course focuses on the historical use of plants as drugs and their role in the development of modern medicinal and pharmaceutical preparations. Introduction to a variety of modern approaches to the discovery of new drugs is included, with reference to current research programs employing them. Films, slides, and demonstrations illustrate the techniques involved.

PMC 1801 Special Research Project (Medicinal Chemistry) 4 Q.H.*

(Prereq. Permission of instructor and program director)
Courses offer directed study or research in one of the medicinal chemistry areas. Students may undertake in-depth investigation of an area of specialized interest including literature search and report.

PMC 1802 Special Research Project (Medicinal Chemistry) 4 Q.H.*

(Prereq. Permission of instructor and program director)
Course offers directed study or research in one of the medicinal chemistry areas. Students may undertake in-depth investigation of an area of specialized interest including literature search and report.

PMC 1803 Special Research Project (Medicinal Chemistry) 4 Q.H.*

(Prereq. Permission of instructor and program director)
Course offers directed study or research in one of the medicinal chemistry areas. Students may undertake in-depth investigation of an area of specialized interest including literature search and report.

Health Professions

General Courses

HRA 1310 Hospital Law 2 Q.H.

This course offers an analysis of the legal principles relating to medical and paramedical practice within a hospital environment. The common law and statutory rights of the hospital, practitioner, and patient are discussed.

HRA 1320 Language of Medicine 4 Q.H.

The course offers a study of the language of medicine, including prefixes, suffixes, roots, abbreviations, and disease, operative, and drug terms. Also included

are terms related to all area specialties. The terms are studied as they relate to a specific system of the body.

HRA 1321 Basic Medical Terminology 2 Q.H.

This course provides a study of the language of medicine and health care. Emphasis is on disease, procedures, and symptomatic terms and their definitions, word construction, analysis, and application. The student is provided an opportunity to acquire working knowledge of medical terminology.

* Lab fee required.

HRA 1330 Foundations of Medical Science I**3 Q.H.**

The course covers major disease problems in our society and modes of treatment. Included are discussion of organized care; diagnosis and treatment; consideration of reproduction, birth, and pediatrics.

HRA 1340 Foundations of Medical Science II

(Prereq. HRA 1330)

3 Q.H.

A continuation of 1330 covering heart, cancer, stroke, blood and lymphatic diseases, accidents, and musculoskeletal, respiratory, and gastro-intestinal diseases.

Toxicology

TOX 1100 Toxicology Orientation**1 Q.H.**

An introduction to toxicology as it relates to clinical, environmental, and regulatory concerns. Includes research principles, clinical toxicology of drugs, water and air pollution concerns. An overview of the field for toxicology and science majors.

TOX 1131 Laboratory Animal Science**4 Q.H.**

(Prereq. BIO 1260, PAH 1204, and/or permission of instructor)

A comprehensive examination of the role of the laboratory animal in biomedical research. Includes historical and legislative aspects of animal research, basic anatomy and physiology, genetics and nutrition, physiological parameters, animal health and disease, and experimental protocols.

TOX 1300 Clinical Toxicology**4 Q.H.**

(Prereq. PMC 1418)

The course focuses on principles of toxicology, including FDA requirements relating to new drugs, environmental and other factors affecting the toxicity of therapeutic agents, mechanisms of toxicity, and clinical applications.

TOX 1301 Fundamental Principles of Systemic Toxicology**4 Q.H.**

(Prereq. PMC 1418)

Course offers a presentation of the principles of toxicology with reference to mode of toxic damage at the cellular and systemic levels. The course includes a discussion of the basic concepts used in evaluation of toxicity and the basic mechanisms through which toxic drug interactions are induced.

TOX 1302 Chemical and Analytical Toxicology

(Prereq. PMC 1418 and TOX 1301)

4 Q.H.

Course offers a presentation of the structure activity approach to toxicology of chemical classes of compounds. The methodology employed to evaluate the safety of chemicals is presented.

TOX 1321 Biochemical Toxicology**3 Q.H.***

(Prereq. TOX 1300, TOX 1301, or TOX 1302)

The objective of this course is 1) to introduce the student to investigational methods for assessing toxicity, 2) to develop the student's ability to analyze and interpret data generated in the lab and in the literature, and 3) to develop technical report writing skills. Rodents are used as a model for toxic insult. Hepatotoxicity, neurotoxicity, teratogenicity, and other toxic manifestations are examined at the whole animal, whole tissue, and biochemical level.

TOX 1801 Special Topics**4 Q.H.**

Selected areas of toxicology will be explored. These may include research, seminars, comparative analysis of data, or faculty-guided programs.

TOX 1802 Special Topics**4 Q.H.**

Selected areas of toxicology will be explored. These may include research, seminars, comparative analysis of data, or faculty-guided programs.

TOX 1803 Special Topics**4 Q.H.**

Selected areas of toxicology will be explored. These may include research, seminars, comparative analysis of data, or faculty-guided programs.

Medical Laboratory Science

The Medical Laboratory professional courses are taught by University faculty, together with supportive clinical faculty.

MLS 1101 Medical Laboratory Science Orientation I**1 Q.H.**

The course focuses on the history and development of the medical laboratory science profession and includes an introduction to medical terminology.

MLS 1102 Medical Laboratory Science Orientation II**1 Q.H.**

Medical Laboratory Science Orientation II is a continuation of Medical Laboratory Science Orientation I

with the addition of a review of mathematics and metric unit calculations.

MLS 1109 Foundations of Clinical Laboratory Science**4 Q.H.**

(Prereq. Admission to physician assistant program or permission by instructor)

Basic laboratory methods employed in primary care,

* Lab fee required.

including urinalysis, gram staining, hematocrit, hemoglobin, sedimentation rate, white cell count, and differential.

**MLS 1111 Basic Medical Laboratory Science
Urinalysis 3 Q.H.***

(Prereq. BIO 1107 and CHM 1122)

Introductory course in basic medical laboratory science covers principles and theories of renal physiology, with laboratory emphasis on techniques for chemical and microscopic detection of normal and abnormal constituents.

MLS 1121 Basic MLS Hematology I 3 Q.H.*

(Prereq. BIO 1107 and CHM 1122)

This introductory course in basic hematology procedures and principles covers hemoglobin, hematocrit, white and red blood cell counts, and white cell differentiation.

MLS 1122 Basic MLS Hematology II 3 Q.H.*

(Prereq. MLS 1121 or MLS 1321)

The course covers principles and procedures of hematology, with emphasis on hematologic cell maturation and morphology and basic hemostasis.

MLS 1131 Basic MLS Immunohematology—Serology 6 Q.H.*

(Prereq. BIO 1107; CHM 1122)

The first section of the course covers basic principles of immunology, with laboratory emphasis on current immunodiagnostic techniques. The second section covers basic principles of immunohematology and related techniques. Laboratory exercises will emphasize blood-banking techniques.

MLS 1141 Basic MLS Clinical Microbiology 6 Q.H.*

(Prereq. CHM 1122, and BIO 1107)

The course focuses on basic principles and techniques of organism isolation, cultivation, and identification from clinical specimens. Elementary serologic procedures are discussed.

MLS 1151 Basic MLS Clinical Chemistry and Instrumentation 5 Q.H.*

(Prereq. MLS 1111 or MLS 1311, CHM 1221)

The course covers principles of clinical chemistry with application to procedures and techniques. Laboratory emphasis on instrumental analysis of clinical specimens.

MLS 1311 Basic MLS Urinalysis 2 Q.H.*

(Prereq. CHM 1122 and BIO 1107)

Introductory course in basic medical laboratory science. Principles and theories of renal physiology with laboratory emphasis on techniques for chemical and microscopic detection of normal and abnormal urinary tract constituents.

MLS 1321 Basic MLS Hematology I 2 Q.H.*

(Prereq. CHM 1122 and BIO 1107)

Introductory course in basic hematology procedures and principles: hemoglobin, hematocrit, white and red blood cell counts, and white cell differentiation.

**MLS 1322 Basic Medical Laboratory Science
Hematology II 2 Q.H.***

(Prereq. MLS 1121 or MLS 1321)

Principles and procedures of basic medical laboratory hematology, including basic hemostasis, are covered.

MLS 1323 Advanced Hemostasis Techniques 2 Q.H.*

(Prereq. MLS 1122 or MLS 1322 or permission of instructor)

Lecture/laboratory course in advanced hemostatic techniques. Theory and methodology will be stressed, along with interpretation of laboratory results.

MLS 1324 Histochemistry 2 Q.H.*

(Prereq. MLS 1621 or MLS 4341 or permission of instructor)

The histochemistry of hemic cells and techniques used in diagnosis of hematological disorders are covered.

MLS 1330 Basic MLS Immunohematology 2 Q.H.*

(Prereq. BIO 1107)

Basic principles in immunohematology and related techniques, with particular emphasis on those procedures used in blood banking, are covered.

MLS 1331 Basic MLS Clinical Immunology 3 Q.H.*

(Prereq. BIO 1107 and CHM 1122)

Topics include basic principles of immunology, with laboratory emphasis on immunodiagnostic techniques currently used in clinical laboratory practice.

MLS 1333 Immunohematology 2 Q.H.*

(Prereq. MLS 1131, 1330, 1331)

This course offers advanced studies in antigen-antibody detection and problem solving through immunohematological tests. Discussion of related hematologic disorders and the medical/legal aspects of blood banking is included.

MLS 1341 Basic MLS Clinical Microbiology 4 Q.H.*

(Prereq. BIO 1107 and CHM 1122)

Basic principles and techniques of organism isolation, cultivation, and identification from clinical specimens are covered. Elementary serologic procedures will be discussed.

MLS 1351 Basic MLS Clinical Chemistry and Instrumentation 4 Q.H.*

(Prereq. CHM 1221 and MLS 1111 or MLS 1311)

Laboratory emphasis on instrumental analysis of clinical specimens.

**MLS 1412 MLT Special Topics — Applied
Microscopy 2 Q.H.**

(Prereq. Admission to MLT Clinical Program)

Clinical practicum in applied urinalysis, parasitology, and mycology at an affiliated hospital providing MLT(ASCP) and CLT(NCA)-level instruction.

MLS 1423 MLT Applied Study in Hematology 2 Q.H.

(Prereq. Admission to MLT Clinical Program)

Clinical practicum in hematology and coagulation at

*Lab fee required.

an affiliated hospital providing MLT(ASCP) and CLT(NCA)-level instruction.

MLS 1432 MLT Applied Study in Blood Banking
(Prereq. Admission to MLT Clinical Program) **2 Q.H.**
Clinical practicum in blood banking at an affiliated hospital providing MLT(ASCP) and CLT(NCA)-level instruction.

MLS 1442 MLT Applied Study in Clinical Microbiology **2 Q.H.**
(Prereq. Admission to MLT Clinical Program)
Clinical practicum in microbiology at an affiliated hospital providing MLT(ASCP) and CLT(NCA)-level instruction.

MLS 1452 MLT Applied Study in Clinical Chemistry **2 Q.H.**
(Prereq. Admission to MLT Clinical Program)
Clinical practicum in clinical chemistry at an affiliated hospital providing MLT(ASCP) and CLT(NCA)-level instruction.

MLS 1480 MLT Seminar I **2 Q.H.**
(Prereq. Admission to MLT Clinical Program)
The course offers a basic introduction to correlation of laboratory findings in hematology, blood banking, microbiology, and clinical chemistry, with appropriate referrals of laboratory information in working situation. Basic use of quality control.

MLS 1523 Hematology MT Applied Study **4 Q.H.**
(Prereq. Acceptance to MT Clinical Program)
Clinical practicum in applied hematology at an affiliated hospital medical technology program, which provides for MT(ASCP), CLS(NCA)-level instruction.

MLS 1532 Immunohematology MT Applied Study **3 Q.H.**
(Prereq. Acceptance to MT Clinical Program)
Clinical practicum in applied immunohematology at an affiliated hospital medical technology program, which provides for MT(ASCP), CLS(NCA)-level instruction.

MLS 1544 Clinical Microbiology MT Applied Study
(Prereq. Acceptance to MT Clinical Program) **7 Q.H.**
Clinical practicum in applied microbiology at an affiliated hospital medical technology program, which provides for MT(ASCP), CLS(NCA)-level instruction.

MLS 1552 Clinical Chemistry MT Applied Study
(Prereq. Acceptance to MT Clinical Program) **7 Q.H.**
Clinical practicum in applied clinical chemistry at an affiliated hospital medical technology program, which provides for MT(ASCP), CLS(NCA)-level instruction.

MLS 1621 Advanced Hematology I **3 Q.H.**
(Prereq. MLS 1122 or permission of instructor)
Topics include physiology of blood cells and bone marrow with a review of physiology of blood hemopoiesis; discussions of hematologic results as they relate to normal, anemic, and leukemic conditions.

MLS 1622 Advanced Hematology II – Hemostasis
(Prereq. MLS 1122 or permission of instructor) **2 Q.H.**
Advanced studies in hemostasis with emphasis on

factor identification and problem solving of hemostatic problems.

MLS 1631 Advanced Immunohematology **2 Q.H.**
(Prereq. MLS 1332)

This course offers blood group systems, antibody identification, and advanced immunohematologic principles and procedures. Case studies will be presented.

MLS 1642 Medical Parasitology **3 Q.H.***
(Prereq. MLS 1141)

Laboratory identification of significant human parasites. Life cycles related to mode of infestation, effect on man, and diagnostic form.

MLS 1643 Medical Mycology **3 Q.H.***
(Prereq. MLS 1341 or MLS 1141)

Laboratory identification of clinically significant fungi with a discussion of modes and types of infections.

MLS 1645 Advanced Clinical Microbiology I **2 Q.H.**
(Prereq. MLS 1141 or permission of instructor)

Topics include host and microbial interactions in disease produced by viruses, rickettsia, chlamydia, mycoplasma, mycobacteria, and actinomyces, with discussion of disease states and laboratory diagnostic procedures.

MLS 1646 Advanced Clinical Microbiology II **2 Q.H.**
(Prereq. MLS 1141 or permission of instructor)

Course covers host and microbial interactions in gastrointestinal, genitourinary, and respiratory tract infections; discussion of disease states and laboratory diagnostic procedures.

MLS 1647 Advanced Clinical Microbiology III **2 Q.H.**
(Prereq. MLS 1141 or permission of instructor)

Topics include host and microbial interactions in closed-space infections and in disease produced by staphylococci and anaerobic organisms. Methods for antibiotic susceptibility testing and principles of infectious disease control are also included.

MLS 1651 Advanced Clinical Chemistry I **2 Q.H.**
(Prereq. MLS 1151 or permission of instructor)

Course includes current methodologies and instrumentation used in clinical chemistry to evaluate hormonal conditions and drug level monitoring.

MLS 1652 Advanced Clinical Chemistry II **2 Q.H.**
(Prereq. MLS 1151 or permission of instructor)

Course includes metabolism of and procedures for nucleic acids, amino acids, proteins, lipids, and carbohydrates.

MLS 1653 Advanced Clinical Chemistry III **2 Q.H.**
(Prereq. MLS 1151 or MLS 1351 or permission of instructor)

Course includes a discussion of laboratory procedures used to evaluate acid-base balance, hepatic, renal, and gastrointestinal systems as well as vitamin and trace-metal blood levels.

* Lab fee required.

MLS 1661 Medical Laboratory Science Education
(Prereq. Completion of clinical program) **2 Q.H.**
The course offers a survey of current topics in medical laboratory science education: developing objectives, methods of evaluation and certification, clinical instruction and evaluation, medical laboratory science curricula, and use of media and other methods of instruction.

MLS 1665 Medical Laboratory Management
(Prereq. Completion of clinical program) **2 Q.H.**
The course offers a survey of factors that relate to effective laboratory administration: hospital organizational structure, principles of management and supervision, cost accounting, purchasing, inspection guidelines, legal responsibilities, and personnel relations.

MLS 1680 MLS Special Topics **2 Q.H.**
(Prereq. MLS 1111 through MLS 1151)
Current topics in the clinical laboratory.

MLS 1681 MLS Senior Seminar **2 Q.H.**
The course provides a review of current undergraduate medical laboratory science topics.

MLS 1831 Advanced Immunology **4 Q.H.**
An introduction to current topics in Immunology. Specific areas discussed include the structure and properties of antigens and antibodies and a detailed description of the various cell types involved in immune reactivity. Other topics may include the regulation of the immune response, transplantation, tumor immunology, and autoimmunity.

MLS 1832 Advanced Immunology Laboratory **1 Q.H.**
Students will perform experiments involving antigen preparation, polyclonal and monoclonal antibody production, various *in vitro* assay techniques, and certain aspects of tissue culture designed to measure cell-to-cell reactivity.

MLS 1890 Undergraduate Research **2 Q.H.**
(Prereq. Special permission)
The course examines special problems in laboratory medicine involving individual research under the direction of a faculty member.

MLS 1891 MLS Current Concepts **1 Q.H.**
Topics for this course are determined by recent advances in medical laboratory science.

Health Record Administration

HRA 1100 Orientation to Medical Records I **1 Q.H.**
This introductory seminar focuses on the issues, activities, and opportunities in the medical record profession.

HRA 1410 Health Record Science I **4 Q.H.**
(Prereq. Two years of arts and sciences)
The course offers introduction to health records; history of the medical record and medical record forms. Included are a study of professional medical record administrators and their relation to the health facility, medical staff, and committees in the hospital. Quantitative analysis of medical records.

HRA 1420 Health Record Science II **4 Q.H.**
(Prereq. HRA 1410)
This course covers the numbering, filing, security, and preservation of medical records; principles of law related to patient care and medical records; emphasis on the rules of privileged communications and the release of information to agencies.

HRA 1430 Health Record Science III **4 Q.H.**
(Prereq. HRA 1420)
The course examines basic principles of compiling statistics for hospital and other health institutions. Topics include the preparation of the daily census and discharge analysis; monthly, annual, and special reports; birth and death certificates; principles of standardized nomenclature of diseases and operations and ICD-9-CM; and study of other indexes used in medical record departments.

HRA 1440 Advanced Health Record Science IV **4 Q.H.**
(Prereq. HRA 1430)
This course covers advanced aspects of health/medical record science. Special focus is on the management of record systems in ambulatory, long-term, home care, and psychiatric settings.

HRA 1450 Applied Health Records Directed Practice I **3 Q.H.**
(Prereq. HRA 1430)
Clinical practicum in medical record science in the general hospital.

HRA 1460 Applied Health Records Directed Practice II **2 Q.H.**
(Prereq. HRA 1450)
Clinical practicum in medical record science in specialized health settings.

HRA 1470 Applied Health Records Science III **4 Q.H.**
Clinical practicum in health/medical records management in the health-care facility.

HRA 1480 Clinical Seminar **2 Q.H.**
Designed to integrate the didactic and the clinical experience at an early stage, the course provides a formal means by which students can share clinical developments with each other. It is designed to give them an opportunity to improve their competency in specific areas of medical record practice.

HRA 1510 Management of Health Record Services 1
4 Q.H.

This course focuses on the medical record department within the health care setting. Lines of responsibility and authority, medical staff and administrative organization, hospital department functions and organization are examined, as are fundamental principles and successful practices of office organization. An opportunity is provided for the student to develop the technical skills necessary to develop organization charts, policies, job descriptions, and job procedures.

HRA 1520 Management of Health Record Services 2
4 Q.H.
(Prereq. HRA 1510)

This course focuses on the medical record department within the health care setting. Budget and cost control mechanisms, organized labor and collective bargaining, office environment and layout, and the impact of state and federal regulations on medical record practices are examined. An opportunity is provided for the student to develop the technical skills necessary to plan and analyze budgets, to plan and design office layouts, and to evaluate the impact of regulations on particular medical record applications.

HRA 1530 Management of Health Record Services 3
4 Q.H.
(Prereq. HRA 1520)

This course focuses on the medical record department within the health care setting. Orientation programs; training programs; in-service education; interviewing, hiring, counseling, motivating, and disciplining employees; and communication skills are examined. An opportunity is provided for the student to develop an orientation and training program, and in-service presentation. Role-playing sessions and case studies are used to develop skill in interviewing, hiring, counseling, disciplining, and motivating employees. Emphasis is placed on verbal skills.

HRA 1540 Quality Assurance
4 Q.H.
(Prereq. HRA 1430, HRA 1440; HRA 1320 or permission of instructor)

This course is designed to provide the student with the opportunity to gain knowledge of the issues and problems involved in designing, implementing, and maintaining quality assurance programs for health-care facilities. An opportunity will also be provided for the student to gain the technical skills necessary to carry out all aspects of the audit process, emphasizing the professional's role as facilitator to physicians and other professional staff.

HRA 1560 Seminar in Health Records
2 Q.H.
(Prereq. Senior status)

Case study and discussion are used to integrate the discrete skills and knowledge of the professional curriculum into a meaningful whole by analysis of real and hypothetical problems. Coordination between the seminar and applied medical record science is emphasized.

HRA 1570 The Health Record Professional: Issues and Problems
2 Q.H.
(Prereq. Senior status)

This course provides the senior health record student with information on a range of topics that are germane to his/her professional role but that may not have been included in other professional courses.

HRA 1610 Introduction to Data Processing for the Health Services
4 Q.H.

This is an introductory course designed to introduce the student to the basic concepts of electronic data processing. Topics considered include input, output, storage, computation, and controls. The basic history of automation is reviewed and the concept of computer language is introduced, utilizing FORTRAN. Simple problems are completed on an individual and group basis.

HRA 1620 Systems Analysis
4 Q.H.
(Prereq. HRA 1550)

This course is designed as an introduction to systems analysis, its concepts, and techniques. Special application to health record management is stressed throughout the course.

HRA 1630 Applied Health Statistics
4 Q.H.
(Prereq. Basic statistics course)

Designed to provide the health record student with the opportunity to learn to apply basic statistical techniques to the gathering, analysis, and interpretation of health care and medical record data, as well as the effective use of these tools in such areas as department management and research studies. Agencies involved in collecting statistical data will be reviewed, with the types and sources of information they require; the relation of statistics, epidemiology, and medical records will also be considered.

HRA 1640 Medical Computer Applications
4 Q.H.
(Prereq. EDP Course I)

This course covers utilization of electronic data processing in health care. Overview of current activities and their impact on future trends in health record management information will be discussed. The role of the RRA as an information specialist will be considered.

HRA 1650 Health Record Education

This course is designed to prepare the health record administration student to function as an in-service educator. Topics include needs assessment, teaching techniques, and evaluation methodology.

HRA 1800 Independent Study
4 Q.H.
(Prereq. Permission of instructor)

This independent study project is designed to give students an opportunity to explore in depth a subject relevant to their interests. It is designed to give them the opportunity to study a problem, present a proposal, carry out a study or a course of action, and prepare both written and oral presentation of their activities.

HRA 1810 Special Topics I**2 Q.H.**

The course provides specialized study in medical records.

HRA 1820 Special Topics II**2 Q.H.**

The course provides specialized study in medical records.

Respiratory Therapy

RTH 1111 Respiratory Therapy Seminar I 1 Q.H.

This is a survey course designed to introduce the beginning respiratory therapy student to the role of respiratory therapists in health-care delivery.

RTH 1112 Respiratory Therapy Seminar II 1 Q.H.

This is a survey course designed to introduce the beginning student to therapeutic modalities of respiratory care.

RTH 1113 Respiratory Therapy Seminar III 1 Q.H.

Continuation of RTH 1112, including introduction to life-support systems.

RTH 1301 Professional Practice Laboratory I

(Prereq. RTH 1331 concurrently) **1 Q.H.***

This lab is designed to provide practice in basic care skills through laboratory exercises and simulation of patient-care situations.

RTH 1302 Professional Practice Laboratory II

(Prereq. RTH 1301, RTH 1332 concurrently) **1 Q.H.***

The lab is designed to provide students with hands-on experience in working with respiratory therapy equipment. Simulated patient-management problems will be set up in the lab to provide problem-solving experience.

RTH 1320 Cardiopulmonary Physiology 4 Q.H.

(Prereq. Satisfactory completion of the first-year courses)

The course is designed to provide a detailed introduction to the clinical diagnostic procedures employed in evaluating cardiopulmonary patients and description of the etiology, patho-physiology, diagnosis, and treatment of major cardiopulmonary diseases.

RTH 1321 Cardiopulmonary Disease 4 Q.H.

(Prereq. Satisfactory completion of the first-year courses)

This course is designed to provide a detailed introduction to the clinical diagnostic procedures employed in evaluating cardiopulmonary patients and description of the etiology, pathophysiology, diagnosis, and treatment of major cardiopulmonary diseases.

RTH 1331 Introduction to Patient Care 4 Q.H.

This course is designed to provide an opportunity for the student to gain knowledge and understanding of basic patient-care skills, including moving and positioning of patients, infection control, basic observation and assessment skills, and familiarity with the techniques of cardiopulmonary resuscitation. An opportunity will also be provided for the development of the student's interpersonal and communication skills.

RTH 1332 Introduction to Respiratory Care 4 Q.H.

(Prereq. RTH 1331 and pharmacology concurrently)

This course is basic to all other professional respiratory therapy courses. Focus is on the theory and application of medical gas administration and humidity/ aerosol therapy.

RTH 1403 Professional Practice Laboratory III

(Prereq. RTH 1302, RTH 1433 concurrently) **1 Q.H.***

The lab is designed to provide students with hands-on experience with respiratory therapy procedures. Simulated patient-management problems will be set up in the lab to provide problem-solving experience.

RTH 1404 Professional Practice Laboratory IV

(Prereq. RTH 1403, RTH 1434 concurrently) **1 Q.H.***

The lab is designed to provide students with an opportunity to acquire experience in working with respiratory therapy life support equipment. Simulated critical care problems will be set up in the lab to provide problem-solving experience.

RTH 1411 Clinical Practice I**6 Q.H.**

(Prereq. RTH 1332 completed and RTH 1433 concurrently)

This is the first course designed to provide clinical experience in hospitals. Focus is on respiratory care for noncritical patients. Emphasis is placed on infection control, medical gas administration, humidification of medical gases, aerosol therapy, chest physiotherapy, deep breathing treatments, and the administration of aerosol medications.

RTH 1412 Clinical Practice II**6 Q.H.**

(Prereq. RTH 1433 completed and RTH 1434 concurrently)

The course is designed to provide clinical experience in hospitals. Emphasis is placed on respiratory care for critical patients. Advanced respiratory care topics such as airway care, mechanical ventilation, and hemodynamic monitoring are reviewed.

RTH 1414 Clinical Seminar I**1 Q.H.**

(Prereq. RTH 1411 concurrently)

The seminar is designed to discuss clinical topics and respiratory-care problems encountered during clinical practice in the hospitals.

RTH 1433 Respiratory Care for the Medical and Surgical Patient**4 Q.H.**

(Prereq. RTH 1332)

This course is a continuation of the introduction to respiratory therapy. It is designed as the didactic portion of beginning clinical experience on noncritical

* Lab fee required.

patients. Focus is placed on respiratory-care problems following major surgery and those problems related to medical patients.

RTH 1434 Respiratory Care for the Critical Patient (Prereq. RTH 1433) **4 Q.H.**

The course is the last in a sequence of three directly related to the theory of respiratory therapy procedures. It is designed as the didactic portion of clinical experience on critical patients. Focus is placed on respiratory-care problems encountered with patients in intensive care units.

RTH 1435 Introduction to Perinatal/Pediatric Respiratory Care (Prereq. RTH 1434) **2 Q.H.**

This course is designed to provide the student with the opportunity to acquire knowledge and understanding of human cardiopulmonary development from the time of conception through childhood years. Normal as well as abnormal manifestations of pregnancy, labor, and the process of delivering are also emphasized. Methods and techniques of assessment and delivery of respiratory care will relate to the pediatric patient's pathophysiology of cardiopulmonary disease.

RTH 1505 Cardiopulmonary Laboratory Practice (Prereq. RTH 1535 concurrently) **1 Q.H.***

This course is designed as the laboratory portion of Cardiopulmonary Laboratory Technology. Focus is placed on the techniques of pulmonary functions testing, blood gas analysis, and cardiovascular testing commonly done in the clinical setting.

RTH 1511 Practicum In Critical Care (Prereq. RTH 1574, RTH 1578) **4 Q.H.**

The course is designed to allow the student to select an area of emphasis from among the following: intensive care units, neonatal-pediatrics, or extracorporeal membrane oxygenation. During the practicum courses students are provided with an opportunity to work in their specialty areas.

RTH 1512 Practicum In Critical Care (Prereq. RTH 1511) **4 Q.H.**

This is a continuation of RTH 1511.

RTH 1513 Perfusion Practicum (Prereq. RTH 1571) **10 Q.H.**

The clinical practice course designed to provide the perfusion technology students with the opportunity to develop, practice, and master skills required to perform extracorporeal circulation procedures. Instruction will also include, but not be limited to, current methods in autotransfusion, myocardial preservation, and intra-aortic balloon support.

RTH 1516 Advanced Clinical Seminar I (Prereq. RTH 1571 concurrently) **1 Q.H.**

This course is designed to complement RTH 1571, Advanced Life Support Systems I. Discussion of current clinical problems related to life-support systems will emphasize problems encountered in the hospital.

RTH 1517 Advanced Clinical Seminar II (Prereq. RTH 1572 concurrently) **1 Q.H.**

This course is designed to complement a professional elective taken concurrently. Discussion of current clinical problems and research related to problems encountered in the hospital.

RTH 1518 Advanced Clinical Seminar III (Prereq. RTH 1511 concurrently) **1 Q.H.**

Course is designed to complement RTH 1511, practicum in Critical Care. Discussion of current clinical problems and research related to critical-care problems is emphasized.

RTH 1519 Advanced Clinical Seminar IV (Prereq. RTH 1512 concurrently) **1 Q.H.**

Continuation of RTH 1518. Complements RTH 1512, practicum in Critical Care.

RTH 1535 Cardiopulmonary Laboratory Techniques (Prereq. RTH 1321 and permission of instructor) **4 Q.H.**

This course is designed to provide the student with an opportunity to gain knowledge and background in principles, theory, and procedures encountered in a clinical cardiopulmonary laboratory. Focus will be placed on the physiological foundations of cardiopulmonary testing.

RTH 1571 Advanced Life Support Systems I (Prereq. RTH 1434) **4 Q.H.**

Designed to introduce students to selected techniques of advanced life support applied to the critically ill patient.

RTH 1572 Perfusion Technology (Prereq. RTH 1571) **4 Q.H.**

Designed to introduce students specializing in perfusion technology to the theory, principles, and concepts of cardiovascular perfusion.

RTH 1574 Advanced Clinical Physiology (Prereq. PAH 1204 and permission of instructor) **4 Q.H.**

This lecture course is designed to enrich the respiratory therapy students' program by providing them with an opportunity for an in-depth exposure to medical physiology, based on the concept of the homeostatic state and its application to the clinical setting.

RTH 1576 Neonatal Respiratory Care (Prereq. RTH 1574) **4 Q.H.**

The course is designed to provide the student with an understanding of the methods and techniques of respiratory therapy for neonatal patients. Emphasis is placed on mechanical ventilation, newborn care, and the respiratory distress syndrome.

RTH 1578 Advanced Medical Monitoring (Prereq. RTH 1574) **4 Q.H.**

The course is designed to enrich the students' program by providing them with an opportunity for an in-depth exposure to the theory and application of physiologic monitoring systems and their use in critical-care settings.

*Lab fee required.

RTH 1631 Management of Respiratory Care**Departments****4 Q.H.**

The major purpose of this course is to expose respiratory therapy students to the techniques, theories, and tools of management which will enable them to develop a workable management system for respiratory care departments. The course is designed to provide an overview and a basic conceptual understanding of the role and the task of managing. It will deal with the functions, duties, and responsibilities of managers, and the things managers must do. Theoretical considerations will be alternated with practical applicants (cases, questions and exercises) to enhance learning.

RTH 1632 Methods and Materials of Teaching**Respiratory Therapy****4 Q.H.**

A study of the systems approach to teaching respiratory therapy. The course covers development of instructional goals based on a needs assessment, behavioral learning objectives, instructional strategies, and evaluation instruments. Emphasis is placed on the use of criterion-referenced measurement strategies to evaluate mastery of clinical skills.

RTH 1633 Student Teaching and Seminar**4 Q.H.**

Part-time participation twelve hours per week in a supervised respiratory therapy learning experience designed to provide practice with didactic, laboratory, and clinical teaching. The students will have an opportunity to demonstrate, evaluate, and develop their teaching skills. A one-hour seminar held weekly will discuss problems encountered in the classroom, laboratory, and hospital.

RTH 1634 Rehabilitation of Children with Respiratory Disorders**4 Q.H.**

The course applies a broad definition of rehabilitation to the life situations of children with respiratory disorders. Students will have the opportunity to learn specific skills that address the recognition and management of acute and chronic problems. Model systems of psychosocial as well as physical support based on these skills will be developed. The course is open to students in health or human service disciplines who have had clinical or field experience.

RTH 1635 Practicum in Pediatric Pulmonary Rehabilitation**1 Q.H.**

(Prereq. RTH 1634 or permission of instructor; enrollment limited)

Counselorship under medical direction at a one-week summer camp for children with severe pulmonary disorders. Students will apply skills acquired in RTH 1634 in residential camp situation and respond to medical or psychosocial problems in a manner consistent with current methods in his/her discipline. Group and individual discussions with the instructor will clarify insights and experiences. Daily case reports will document the learning process.

RTH 1801 Directed Independent Study I**2 Q.H.**

(Prereq. RTH 1511 concurrently)

This is a course of directed study in a student's major wherein in-depth investigation of a special interest area is undertaken.

RTH 1802 Directed Independent Study II**2 Q.H.**

(Prereq. RTH 1512 concurrently)

This is a course of directed study in a student's major wherein in-depth investigation of a special interest area is undertaken.

Nursing

NUR 1100 Introduction to Professional Nursing and the Health Sector**4 Q.H.**

The first course in nursing introduces the student to concepts of health, the health care delivery system, professional nursing and roles in nursing. A variety of societal and environmental factors that affect the health care system in general and nursing practice in particular will be examined.

NUR 1101 The Theoretical Basis for Nursing Practice**4 Q.H.**

(Prereq. NUR 1100)

This course introduces the philosophical and theoretical basis for the practice of nursing. Major nursing theorists are surveyed. The role of theory and its use in nursing practice is discussed. The concepts and theories that constitute the conceptual framework of the curriculum are emphasized. From the perspective of adaptation theory as the organizing theme of the curriculum, concepts essential for learning the

professional nursing practice role are introduced. Building from the concepts about health and illness introduced in NUR 1100, the concepts *client*, *human need*, and *nursing process* are explored. Communication as an essential professional role behavior is emphasized.

NUR 1102 Human Nutrition**4 Q.H.**

(Prereq. NUR 1100)

The study of the science of nutrition provides the student the opportunity to plan and select a nutritionally adequate and prudent diet; recognize food and nutrition misinformation; utilize objectivity when working with individuals to meet their nutritional needs; and recognize the importance of nutrition and its relation to health. The course will examine the physiological functions of the major nutrients and food sources, as well as common areas of consumer concern about nutrition.

NUR 1200 Nursing**6 Q.H.**

(Prereq. NUR 1100, NUR 1101, NUR 1102, CHM 1111, CHM 1112, BIO 1140, BIO 1141, BIO 1295)

Students will explore and begin to enact the professional role in a clinical setting. Implementation of nursing process and psychomotor skill development are given particular emphasis. Students provide basic nursing care while strengthening their understanding of nursing process through its application to individuals. Nursing models will be discussed in terms of their potential to add diversity to nursing approaches. Lectures and assignments assist the student to utilize and explain the scientific and conceptual basis for nursing activities. Professional responsibility is explored in a legal and ethical framework with specific attention to the students' individual role development.

NUR 1201 Nursing**6 Q.H.**

(Prereq. NUR 1200, BIO 1190, BIO 1293)

Students will continue to enact the professional role in a clinical setting. Physical assessment and patient education are given particular emphasis. Students provide basic nursing care and continue to strengthen their understanding of nursing process. Lectures and assignments assist the students to utilize and explain the scientific and conceptual basis for nursing activities. Professional responsibility is explored in the context of change and leadership.

NUR 1300 Common Problems**7 Q.H.**

(Prereq. NUR 1201)

The nursing process is continued and implemented in more complex situations. Assessment of client/patient status and nursing interventions are centered on individuals with pathophysiological and psychological disturbances. Major content areas addressed are: adaptation to inflammations, immunity, stresses or pre- and post-operative experiences, and metabolic responses related to alteration in health status. The effects of the client/patient's altered status on family members are explored. Students are introduced to drug therapy and begin administration of medications. Under faculty guidance, students develop a teaching plan and nursing care analysis for selected clients. Learning experiences are planned for students to provide for continuity of patient care through collaboration with clients, health team members, and appropriate community agencies.

NUR 1301 Psychiatric/Mental Health Nursing

(Prereq. NUR 1300 or NUR 1302)

7 Q.H.

This course is designed to help students develop a beginning knowledge of mental and emotional illness through a basic understanding of the dynamics of human behavior and beginning skills in therapeutic intervention. The student is introduced to the concepts of family and group therapy and crisis intervention techniques.

NUR 1302 Transition**9 Q.H.**

(Prereq. CHM 1111=n1112, BIO 1140=n1141, BIO 1293, BIO 1295, PSY 1111=n1112, BIO 1120)

The first nursing course for registered nurse students

in the baccalaureate degree program introduces the purposes and objective of this program and the philosophy of baccalaureate education. It also broadens students' perspectives of professional nursing and provides opportunities to complement and validate, through guided and independent study, students' knowledge of roles and role conflicts, the communication process, group dynamics, and the nursing process.

NUR 1303 Life Crises: Analysis and Response**4 Q.H.**

This interdisciplinary course concerns personal, family, and community crises identified from literature, health agency clientele, and student sources. Concepts from nursing, sociology, anthropology, and social psychology are used to assess critically the individual's experience of crisis and the approaches used by providers in human service systems to help people in crisis, (e.g., at times of death, divorce, job loss, illness, rape, suicide attempt, and natural disaster). This course is intended as an opportunity for students in consumer and/or health and human service roles to: (1) critically examine the meaning of life crises in a social-cultural vs. psychopathological framework; and (2) explore principles and creative strategies that might be used in responding constructively to crises in their own lives or in their experience as health or human service workers. Instructional methods include lectures and discussions emphasizing critical analysis of crisis situations from the literature, from personal and professional experience, and from films. The course is open to upper-division students in nursing, criminal justice, and applied social science, and the health professions.

NUR 1400 Maternal and Child Nursing**9 Q.H.**

(Prereq. PSY 1241, PCL 1305, and NUR 1300; NUR 1301 or 1302)

The focus of this course is on the application of the nursing process in maintaining optimal health for child-bearing and child-rearing families from various cultural and social backgrounds. Opportunity is provided for students to apply nursing process with clients at selected developmental stages and to assist families in coping with stresses that interfere with health. Learning experiences provided assist the student in furthering personal and professional development.

NUR 1401 Medical-Surgical Nursing**9 Q.H.**

(Prereq. NUR 1300, NUR 1301, PCL 1305)

Focus is placed on the effects of episodes of acute illness on individuals, families, and society. Alterations and adaptations in physiology characteristic of acute episodes of illness and the nurse's role in intervention are discussed. Content also includes discussion of the impact of illness on patterns of living, needs for health teaching, and continuity of care. Guided clinical experiences are planned, with emphasis on the use of the nursing process and the development of those skills necessary to plan and implement care for the adult who is in an acute care setting.

NUR 1500 Community Health Nursing 9 Q.H.

(Prereq. NUR 1401, NUR 1400, PSY 1242, SOC 1100)

This course provides an opportunity for students to increase their understanding of the variety of ways in which families, groups, and communities organize to meet the health and welfare needs of their members. Particular attention is given to the role of the nurse in planning with individuals, families, groups, and community agencies to meet recognized needs. Themes occurring throughout the course include political implications of health care delivery and current research that affects family and group health and community nursing. Values clarification and cultural experience of nurse and client, are also explored. Laboratory experience involves work with individuals, families, and communities.

NUR 1501 Contemporary Issues in Nursing 5 Q.H.

(Prereq. NUR 1401, NUR 1400, SOA 1100)

This course provides the student with the opportunity to examine the current body of nursing knowledge as it is organized within the various conceptual models of nursing. Student will also analyze contemporary issues in nursing within the context of the historical background of the profession and those forces which influence it. Present and future roles of the professional nurse are discussed.

NUR 1502 Introduction to Research in Nursing(Prereq. NUR 1401, NUR 1400, SOA 1100) **4 Q.H.**

This course builds on students' prior exposure to selected studies applied to nursing. Both qualitative and quantitative research are discussed. The value of each to the practice of nursing and the significance of research in nursing to both practitioner and consumer are emphasized.

Criminal Justice

CJ 1101 Administration of Criminal Justice 4 Q.H.

This course surveys the contemporary criminal justice system from the initial contact with the offender through prosecution, disposition, incarceration, and release to the community. Emphasis is placed on major systems of social control: police, corrections, juvenile justice, mental health systems, and their policies and practices relative to the offender. A balance is maintained in providing legal, empirical, and sociological materials.

CJ 1110 Topics in History of Criminal Justice**4 Q.H.**

The course provides a historic survey of the principles of criminal justice in the ancient and medieval periods, with emphasis upon the impact of religion and philosophy.

CJ 1111 Topics in History of Criminal Justice**4 Q.H.**

A continuation of the historic survey with an examination of the effects of the Renaissance and the Reformation, and the rise of nation states.

CJ 1112 Critical Issues in Criminal Justice and Criminology**4 Q.H.**

Introduces students to the major issues and ethical considerations facing criminal justice and criminology today. There will be six to eight major critical, moral, and ethical issues discussed. Core topics could be (but are not confined to) the death penalty, abortion, euthanasia, abolition of the insanity plea, victimless crimes (prostitution, drug abuse, gambling), and gun control. These issues will be presented in the format of pros and cons and will involve student presentations or debates.

CJ 1113 Critical Issues in Criminal Justice Administration**4 Q.H.**

Provides a comprehensive understanding of the major issues in the functional areas of law enforcement, private security, prosecution, and courts. This course is designed to stimulate and reflect the controversial characteristics of many criminal justice operations. Students are exposed to these debates through the objective presentation of all sides of the issues.

CJ 1151 Introduction to Law and the Legal Process**4 Q.H.**

Provides an introduction to the law and the legal system of the United States. It sets forth the fundamentals of our legal process and provides a summary description of both the private and public law system. Its goal is to present an overview of the traditional structure, as well as the basic principles of law.

CJ 1201 Criminology**4 Q.H.**

The course covers patterns and evolution of criminal behavior, the social forces involved, and development of the individual criminal; administration of criminal justice — law, courts, police, prisons.

CJ 1251 Introduction to Criminal Law**4 Q.H.**

The course deals with the area of criminal responsibility, some of its limitations, and certain modifications substantially affecting it. The course requires an ability to express in writing both the knowledge of a particular concept and the ability to identify it in a complex fact pattern and discuss its implications and ramifications.

CJ 1252 Criminal Due Process**4 Q.H.**

(Prereq. CJ 1251)

This is a required course focusing on a historical evaluation of the Fourteenth Amendment and its use in making rights prescribed under the Bill of Rights

applicable to the individual states. Also detailed in the course are the inherent problems of the Fifth and Sixth Amendments, including the effect of their implications on such matters as police practices, illegal search and seizure, and right to counsel. Students are expected to be familiar with basic concepts as well as changing interpretations so that they can cite cases that may stand as precedents for conclusions they draw.

CJ 1301 Introduction to Security 4 Q.H.

The course examines the organization and administration of security and loss prevention programs in industry, business, and government. Emphasis is placed on the protection of assets, personnel, and facilities, and focuses on the relations between security organizations and government agencies.

CJ 1311 White-Collar Crime 4 Q.H.

Intends to give the student a basic understanding of white-collar crime. The course will cover such topics as: nature and extent of white-collar crime, the social-psychologic makeup of white-collar crime—typologies, present efforts directed toward controlling it, and understanding the interagency and jurisdictional problems and the benefits of cooperation.

CJ 1312 Organized Crime 4 Q.H.

Provides the student with an understanding of the phenomenon labeled "organized crime." It is approached from the law enforcement perspective; however, the general criminal justice implications are stressed. The corruptive influences of the phenomenon are dealt with, as well as the overzealous enforcement aspects which lead to violations of constitutional safeguards. The nature of intelligence activities and computerized information concerning organized crime are explored, as well as the sensitive privacy issues that are concerned. Problems of definition, identification of participants, attainment of public understanding and support, legal limitations in dealing with the phenomenon, and the involvement of otherwise reputable citizens as consumers or unwitting allies are discussed. Strategies, both present and proposed, for controlling or eliminating organized crime are considered. Finally, the relationship of this phenomenon to "white-collar crime" is evaluated.

CJ 1314 Security Management and Supervision 4 Q.H.
(Prereq. CJ 1301 or equivalent)

Deals with the roles and responsibilities of the security manager. Special attention is given to the responsibilities of planning, organizing, staffing, directing, controlling, representing, and innovating. The manager's responsibility in professionalizing security and other relevant issues are also explored.

CJ 1315 Security Design and Technology 4 Q.H.
(Prereq. CJ 1301 or equiv.)

Acquaints students with options and applications of today's scientific and technological products. An attempt is made to prepare students in the area of security planning and develop in them the managerial skills needed to plan security systems using the state-of-the-art modern-day technology.

CJ 1317 Crime Prevention and Security 4 Q.H.

This course assumes that all citizens have the responsibility to prevent crime and promote security. The content ranges from the theoretical level to the organizational and personal strategies of how to employ the techniques necessary to protect oneself and others from crime, thereby promoting crime prevention and security.

CJ 1318 Terrorism 4 Q.H.

Attempts to give the student an understanding of what terrorism is and why it has become so popular. Topics examined will include: the role of news media, political consequences of terrorism, the military as a resource, and the role of the hostage.

CJ 1401 Law Enforcement Administration and Management 4 Q.H.

The course covers the principles of police organization, administration, and management, including staff and line functions, chain of command, span of control, selection of personnel, and promotional systems. Consideration is also given to special problems such as strikes, natural and atomic disasters, narcotic traffic, and vice control.

CJ 1411 Police Operations 4 Q.H.
(Prereq. CJ 1401)

The course offers a general survey of police operational procedures, including patrol, traffic, interrogations, and report writing. Role playing is used extensively to demonstrate interviewing methods.

CJ 1421 Police-Community Relations 4 Q.H.
(Prereq. CJ 1401, CJ 1411, and junior or senior status)

The course covers police-public contact; uses of the communications media in projecting the police image; responsibilities of police in dealing effectively with minority groups, civil rights, civil disorder, and public protection. An exploration of the role and function of the police in intergroup relations is also included.

CJ 1422 Human Factors in Policing 4 Q.H.
(Prereq. CJ 1411)

This course focuses on the theory and practice of human relations and conflict management necessary for effective policing. It is recommended for those with a career interest in policing.

CJ 1423 Criminal Justice Planning 4 Q.H.
(Prereq. CJ 1452; a statistics course; and middler, junior, or senior standing)

The course examines criminal justice planning theory and methods. Emphasis is on the need for criminal justice planning and the tools used in the planning process. Students in small groups are expected to prepare a sample criminal justice plan during the term.

CJ 1424 Seminar in Law Enforcement 4 Q.H.
(Prereq. CJ 1401, CJ 1411, and junior or senior standing)

The course provides an opportunity for free discussion about the numerous problems facing the law enforcement officer. Periodic oral and written reports

are required. Guest lecturers are invited to participate in and lead discussion sessions. An effort is made to have students formulate their own philosophy of law enforcement prior to graduation.

CJ 1425 Police Discretion

4 Q.H.

(Prereq. Middler, junior or senior standing)

This course examines the nature and impact of discretion as it relates to police decision making. Attention is given to various forms of police discretion and ways in which it can be structured, confined, and checked. Students have the opportunity to examine and learn to analyze sample police department policies and study different formal and informal methods of developing policies. Students also study the relation of discretion to controlling police behavior and police corruption.

CJ 1451 Criminal Justice Research

4 Q.H.

(Prereq. MTH 1010 or equiv., and middler, junior, or senior standing)

This is a survey course of methods for basic and applied research in criminal justice, combining statistics and research methods. While providing minimal research literacy, this course concentrates on research application by stressing discussion of the general role of research in the discipline and specific contributions advanced by studies in the literature.

CJ 1452 Research Methods in Criminal Justice

4 Q.H.

(Prereq. A statistics course and middler, junior, or senior standing)

The course focuses on development of research design of the kind most useful to criminal justice problems; understanding some of the most important issues and problems facing researchers in the field; use of various data collection methods, including observation, interviewing, questionnaire construction, and scales for survey analysis; validity and reliability; computer application in criminal justice.

CJ 1471 Criminal Investigation I

4 Q.H.

Designed to instruct the student as to the importance of the investigator in the criminal justice system. Presented are the scientific techniques and organization of a criminal investigation, demonstrating the advantages an investigator gains when using such scientific techniques. Offering a synergistic approach to learning, this course uses a modern textbook to provide a firm foundation and enhances it with lectures by several experienced practitioners who relate the real world of criminal investigation to the fundamentals presented in the course text. The instructors cement the union of these two views by presenting practical demonstrations of the scientific techniques in evidence processing.

CJ 1472 Criminal Investigation II

4 Q.H.

(Prereq. CJ 1471)

The basic approach of instruction has the same educational format as Criminal Investigation I but studies in depth the typical offenses encountered by

the criminal investigator. These include, but are not limited to, the following: robbery, burglary, motor vehicle theft, sex offenses, death investigation, organized crime, fraud, drugs and narcotics, and arson. Fire and arson investigations differ in many aspects from the investigation of other crimes. A major portion of the course is devoted to this comparison.

CJ 1473 Forensic Laboratory

4 Q.H.*

(Prereq. CJ 1471)

A survey of the elements of microscopy and basic chemistry as they apply to the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons, and other materials that constitute physical evidence.

CJ 1501 Evidence I

4 Q.H.

(Prereq. CJ 1251, CJ 1252)

The goal of this course is to provide students the opportunity to develop their understanding of the manner in which legal issues and disputes are resolved by trial. Study will focus on the manner in which the trial system works and the reasoning behind the rules governing its operation, including rules of evidence: the mechanics of the adversary system, relevancy, reliability, and rules of exclusion based upon policy considerations other than relevancy and reliability. Learning tools will include videotapes, mock trials, observation of actual court trials, lectures, take-home assignments, and exams.

CJ 1502 Evidence II

4 Q.H.

(Prereq. CJ 1501)

This course continues with reliability and rules of exclusion, based upon policy considerations other than relevancy and reliability as set forth in Part I.

CJ 1511 Survey of Criminal Evidence

4 Q.H.

(Prereq. CJ 1251, CJ 1252)

This survey course focuses upon the fundamentals of criminal trial procedure and the rules of evidence as they apply to the trial of a criminal case. Students are required to read and brief criminal court cases.

CJ 1512 Seminar in Law and Criminal Justice

4 Q.H.

(Prereq. CJ 1251, CJ 1252, and junior or senior standing)

Specific topic to be announced.

CJ 1601 Survey of Correctional Systems

4 Q.H.

(Prereq. CJ 1201)

The course offers an introduction to penology and corrections, exploring the public reaction to convicted offenders historically, while concentrating on issues and programs of contemporary corrections.

CJ 1611 Theories in Penology

4 Q.H.

(Prereq. SOC 1100 and CJ 1201)

The course offers a philosophical approach to the development of punishment in the United States, as examined in a historical context. Issues of justice and morality are considered as they are manifested in contemporary penal structure. Readings include

*Lab fee required.

selections from eighteenth-, nineteenth-, and twentieth-century novelists, philosophers, and criminologists.

CJ 1612 The Administration of Juvenile Justice 4 Q.H.
(Prereq. SOC 1100, CJ 1201)

Course work examines the juvenile court, its philosophy, procedure, and personnel. Focus is on the discretionary processes by which juveniles are labeled delinquent, dependent, and neglected. The roles played by police, prosecution, defense, bench, and social service workers are considered. Field visits are arranged.

CJ 1613 Probation and Parole 4 Q.H.
(Prereq. CJ 1601)

The course examines the nature and problems of correctional field service, both adult and juvenile.

CJ 1614 Correctional Institutions 4 Q.H.
(Prereq. CJ 1601)

The course offers an analysis of the organization and administration of correctional institutions.

CJ 1615 Crime and Criminal Justice: A Comparative View 4 Q.H.
(Prereq. CJ 1101, SOC 1100, or equiv.)

The course examines the problems of crime and its control from a comparative perspective. Countries such as the Soviet Union, China, France, East and West Germany, Great Britain, Holland, Finland, and Sweden are analyzed in terms of incidence and type of deviance and crime, as well as in terms of their approach to social control and the prevention of crime. Points of divergence between these countries and the United States will be examined, with regard to their perceived causes of crime and their differing approaches to rehabilitation and crime prevention.

CJ 1616 Women and the Criminal Justice System 4 Q.H.
(Prereq. Middler, junior, senior standing)

This course is intended to introduce students to issues relating to roles taken by women involved with the criminal justice system and to the system's various responses to women in these roles. Specific focus will be directed toward women as victims of crime, as offenders, and as practitioners.

CJ 1617 The Female Offender 4 Q.H.
(Prereq. SOC 1100 and CJ 1201)

The course addresses itself to the female at various stages in the criminal justice system, from commission of a crime to parole. Both the juvenile and adult offender are studied. The thrust of the course is a critical analysis of existing theory and research on the female offender, with emphasis on the socialization, roles, and social participation of society at large. The male offender is also considered at each level for purposes of comparison.

CJ 1618 Victims of Crime 4 Q.H.

Examines current theory and research regarding victims of crime. Special attention is devoted to concepts such as victim vulnerability and victim culpability. In addition, the implications of a victim-oriented perspective for the administration of justice are discussed. Current victim programs, including restitution, mediation, and compensation, are assessed.

CJ 1801, CJ 1802, CJ 1803, CJ 1804 Directed Study (each) 4 Q.H.

Military Science

AIR 1110 The Air Force Today 1 Q.H.

Examines the role of the U.S. Air Force in the contemporary world. Topics include background, mission, and organization of Air Force and functions of U.S. strategic forces. Also, emphasis is placed on development of written communicative skills.

AIR 1111 Leadership Laboratory I 1 Q.H.

Introduction to the customs, traditions, and courtesies of the Air Force through guest speakers, seminars, and a field trip to an Air Force base.

AIR 1120 Air Force Today 1 Q.H.

Continues study of the contemporary Air Force by examining general purpose forces, aerospace support forces, and the total force structure.

AIR 1121 Leadership Laboratory II 1 Q.H.

Continues AIR 1111 with emphasis on the role and responsibilities of an Air Force company grade officer.

AIR 1130 The Air Force Today 1 Q.H.

The third and final portion of the study of the contemporary Air Force of today. This portion of the course gives a more in-depth study of the total force structure.

AIR 1131 Leadership Laboratory III 1 Q.H.

Continues AIR 1121 with emphasis on a more in-depth study of the roles and responsibilities of Air Force company grade officers.

AIR 1210 The Development of Air Power 1 Q.H.

History of the development of air power from balloon experiments up through World War II. Emphasis on interrelation of technology, doctrine, historical events. Student participation and presentations are emphasized to enhance verbal communicative skills.

AIR 1211 Leadership Laboratory IV 1 Q.H.

Emphasizes development of techniques used to direct and inform. Students are assigned leadership and management positions in the AIR 1111 programs described above.

AIR 1220 The Development of Air Power 1 Q.H.
History of airpower since 1946, with emphasis on the U.S. Air Force. Includes the role of air forces in conflicts and the effect of space-age technology on air power. Also an examination of the employment of U.S. air power in peaceful ways.

AIR 1221 Leadership Laboratory V 1 Q.H.
Continues AIR 1211. Adds a special program in preparation for field training.

AIR 1310 Management and Leadership I 4 Q.H.
Management and leadership from the point of view of the Air Force junior officer. The individual motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for the development of the junior officer's professional skills as an Air Force officer.

AIR 1311 Leadership Laboratory VI 1 Q.H.
Supervisory practice and exercise of leadership functions in controlling and directing activities of the cadet group. Development of leadership potential in a practical, supervised training laboratory.

AIR 1320 Management and Leadership II 4 Q.H.
Continues AIR 1310 with special emphasis on the basic managerial processes involving decision making, utilization of analytical aid in planning, organizing, and controlling in a changing environment. Organizational and personal values, management of forces in change, organizational power, politics, and managerial strategy and tactics are discussed within the context of the military organization. Actual Air Force cases are used to enhance the learning and communication processes.

AIR 1321 Leadership Laboratory VII 1 Q.H.
Continues AIR 1311. Emphasis on supervisory and leadership skills. Emphasis on advantages of an Air Force career.

AIR 1410 The Military in American Society 4 Q.H.
Study of the military's role as an institution in a democratic society. Topics: civil-military interaction and the military as a profession. Emphasis on developing communicative skills through student presentations.

AIR 1411 Leadership Laboratory VIII 1 Q.H.
Exercise of management functions in planning, supervising, and directing cadet group activities. Opportunity to acquire proficiency in military leadership skills.

AIR 1420 U.S. National Security 4 Q.H.
Study of the role of the military in maintaining the security of the United States. Examines the international environment, the background of defense policy, strategy, and forms of conflict. Addresses specific issues, including weapons acquisition, arms control, nuclear deterrence, and the national military decision-making process.

AIR 1421 Leadership Laboratory IX 1 Q.H.
Continues AIR 1411. Students prepare themselves for professional duties.

ARM 1100 Leadership Lab I 0 Q.H.
Introduction of first-year ROTC students to the basic tenets of discipline and regimentation of the U.S. Army. Includes the basics of proper wear of military clothing, proper rendering of military courtesies, military customs and traditions, individual and group drill and ceremonies, manual of arms for the M16A1 rifle, and physical fitness training. Attendance required for all first-year cadets enrolled in an ROTC course.

ARM 1101 Introduction to the Army 1.5 Q.H.
Introduction of first-year ROTC students to the basic customs and traditions of the Army and ROTC, and the benefits, obligations, and structures of both. The course defines each Army branch (infantry, armor, field artillery, etc.) to include the branch mission and nature of primary duties associated with an officer's assignment to a particular branch. Rappelling, knot tying, rope bridge building, and land navigation techniques are taught and executed in a hands-on environment.

ARM 1102 Basic Leadership Skills 1.5 Q.H.
Basic Leadership Skills is a modular training course designed to teach leadership and management concepts. There are four modules, each designed to illustrate particular management skills: problem analysis and decision-making, planning and organizing, delegation and control, and interpersonal skills. Realistic management simulations and structured exercises are the primary methods used to teach essential leadership skills.

ARM 1103 Tactical Simulations 1.5 Q.H.
Mission, organization, and composition of the basic infantry rifle squad. Includes basic combat formations, movement techniques, unit capabilities, and planning considerations. Uses the Dunn-Kempf war-game in a series of practical exercises that apply classroom instruction through use of a boardgame and miniatures simulating the modern battlefield.

ARM 1200 Leadership Lab II 0 Q.H.
Introduction and hands-on training for the second-year ROTC cadets. Includes required basic military skills, including nuclear, biological, and chemical protective training; selected weapons training; use of U.S. Army communications equipment; land navigation; orienteering; rappelling; and limited military vehicle maintenance training. Attendance required for all second-year ROTC cadets enrolled in an ROTC course.

ARM 1201 Marksmanship 1 Q.H.
Instruction and practical application in basic rifle marksmanship techniques, safety, and range operation. The course will cover sanctioning bodies rules for small-bore rifle competition firing, preparation for competition firing, preparation for competition, and intra-class competition.

ARM 1202 Comparative Armies**1.5 Q.H.**

An introduction to the roles and organization of the U.S. Army, Army Reserves and National Guard. Utilizing these concepts as building blocks, an examination and comparison of armies currently impacting on U.S. doctrine and tactics is undertaken. The Soviet, Warsaw Pact, NATO, Israeli, and Third World forces are integrated into the course structure through the study and examination of current events inside and outside the military establishment.

ARM 1203 Methods of Instruction**1.5 Q.H.**

This course provides an introduction to the concept of training management, including the fundamentals of teaching, principles of learning, and the establishment of training objectives. In addition, students will demonstrate proper instructional techniques and lesson plan preparation and conduct classroom instruction. For the most part, specific emphasis is given to hands-on student participation and performance-oriented training.

ARM 1301 Land Navigation**2 Q.H.**

Identify map symbols to natural and manmade features; identify/use military grid reference system; measure straight line and read distance on a map; measure and plot an azimuth; convert azimuth from grid to magnetic grid; grid; locate an unknown point using polar coordinates; locate an unknown point using intersection; locate an unknown point using resection; locate an unknown point using modified resection; determine the evaluation of a specific point on the map. Inspect a compass for accuracy; navigate from one point on the ground to another.

ARM 1302 Military Tactics and Training**2 Q.H.**

Introduction to the fundamentals of offensive and defensive combat at the squad and platoon levels. Includes unit organizations and capabilities, tactical planning, combat orders; utilizes practical exercises placing the student in leadership roles in simulated tactical environments. Additionally, students will learn the proper method to conduct briefings, provide training input, and prepare, conduct, and evaluate training.

ARM 1303 Advanced Leadership Clinic**2 Q.H.**

Classroom, programmed instruction, and practical exercises (e.g., land navigation, physical conditioning, weapons familiarization, and leadership) designed to prepare cadets for maximum individual performance at the six-week ROTC advanced camp, Fort Devens, MA. This course is required for all cadets attending advanced summer camp at Fort Bragg, NC.

ARM 1305 Advanced Leadership Lab V**6 Q.H.**

External leadership lab conducted at Fort Bragg, North Carolina, during the summer quarter. Intensive six-week course includes application of leadership principles in positions at varying levels of responsibility. Supplemental instruction includes: physical conditioning, counseling, senior-subordinate relations, tactical doctrine, international laws of land warfare, and approaches to problem solving. Course attended by students from 123 colleges and universities from

Maine to Florida. All expenses are borne by the U.S. Government, including a stipend of approximately five hundred dollars.

ARM 1400 Leadership Lab IV**0 Q.H.**

Practical application of previously learned skills, techniques, education, and experience by fourth-year ROTC cadets by assisting ROTC cadre in the conduct of ARM 1100, ARM 1200, and ARM 1300. Cadets prepare and present instruction, manage constrained resources, and supervise subordinates. Evaluation is based on active-duty Army criteria. Attendance required for all fourth-year ROTC cadets enrolled in an ROTC course.

ARM 1401 Organizational and Communication**Skills****2 Q.H.**

This course will examine the theory, methods, and principles for understanding and motivating human behavior in organizations. The principles and dynamics of leadership will be emphasized and directed toward the development of leadership styles. Practical applications will be made through the use of case studies and group processes.

ARM 1402 Military Law and Ethics**2 Q.H.**

Examination of the issues and responsibilities imposed by law on commanders and staff officers in two broad areas: (1) The military criminal justice system and (2) military administrative law. In the criminal law area, the course presents in-depth analysis of the responsibilities and duties of officers and noncommissioned officers operating in the military justice system. Administrative law subjects focus on the legal basis for command and on administrative due process, judicial review of military activities, and other topical issues. Students address and develop an understanding of the need for ethical conduct and an awareness and sensitivity to ethical issues.

ARM 1403 Leadership Seminar**2 Q.H.**

Provides the senior ROTC cadet with need-to-know information which facilitates his/her entry into active duty. It also provides a forum for a study of personnel, training, logistical, and installation support systems. Personal finances are discussed as well as the officer and noncommissioned officer evaluation systems.

NAV 1100 Naval Science Lab**0 Q.H.**

A period devoted to either drill instruction or to practical work to complement classroom instruction. This course must be taken in each class quarter by all NROTC students.

NAV 1101 Introduction to Naval Science**3 Q.H.**

A general introduction to the naval profession and to concepts of seapower. Instruction emphasizes the mission, organization, and warfare components of the U.S. Navy and Marine Corps. Included is an overview of officer and enlisted ranks and rates, training and education, and career patterns. The course also covers naval courtesy and customs, military justice, leadership, and nomenclature. This course exposes the student to the professional competencies required to become a naval officer.

NAV 1102 Naval Ships Systems I 4 Q.H.

A detailed study of ship characteristics and types including ship design, hydrodynamic forces, stability, compartmentation, propulsion, electrical and auxiliary systems, interior communications, ship control, and damage control. Included are basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Also discussed are shipboard safety and firefighting.

NAV 1201 Naval Ships Systems II 4 Q.H.

This course outlines the theory and employment of weapons systems. The student explores the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Fire control systems and major weapons types are discussed, including capabilities and limitations. The physical aspects of radar and underwater sound are described in detail. The facets of command, control, and communications are explored as a means of weapons system integration.

NAV 1202 Seapower and Maritime Affairs 3 Q.H.

A survey of the U.S. naval history from the American Revolution to the present with emphasis on major developments. Included is an in-depth discussion of the geopolitical theory of Mahan. The course also treats present-day concerns in seapower and maritime affairs, including the economic and political issues of merchant marine commerce, the law of the sea, the Russian navy and merchant marine, and a comparison of U.S. and Soviet naval strengths.

NAV 1301 Navigation and Naval Operations I**4 Q.H.**

An in-depth study of piloting and celestial navigation, including theory, principles, and procedures. Students learn piloting navigation, including the use of charts, visual and electronic aids, and the theory and operation of magnetic and gyro compasses. Celestial navigation is covered in depth, including the celestial coordinate system, an introduction to spherical trigonometry, the theory and operation of the sextant, and a step-by-step treatment of the sight reduction process. Students develop practical skills in both piloting and celestial navigation. Other topics discussed include tides, currents, effects of wind and weather, plotting, use of navigation instruments, types and characteristics of electronic navigation systems, and the day's work in navigation.

NAV 1302 Navigation and Naval Operations II**4 Q.H.**

A study of the international and island rules of the nautical road, relative-motion vector-analysis theory,

relative motion problems, formation tactics, and ship employment. Also included is an introduction to naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, and afloat communications.

NAV 1310 Evolution of Warfare**4 Q.H.**

This course traces historically the development of warfare from the dawn of recorded history to the present, focusing on the impact of major military theorists, strategists, tacticians, and technological developments. The student acquires a basic sense of strategy, develops an understanding of military alternatives, and sees the impact of historical precedent on military thought and action.

NAV 1401 Leadership and Management I 3 Q.H.

A comprehensive advanced-level study of organizational behavior and management in the context of the naval organization. Topics include a survey of the management functions of planning, organizing, and controlling, an introduction to individual and group behavior in organizations, and extensive study of motivation and leadership. Major behavioral theories are explored in detail. Practical applications are explored by the use of experiential exercises, case studies, and laboratory discussions. Other topics developed include decision making, communication, responsibility, authority, and accountability.

NAV 1402 Leadership and Management II 3 Q.H.

The study of naval junior officer responsibilities in naval administration. The course exposes the student to a study of counseling methods, military justice administration, naval human resources management, directives and correspondence, naval personnel administration, material management and maintenance, and supply systems. This capstone course in the NROTC curriculum builds on and integrates the professional competencies developed in prior course work and professional training.

NAV 1410 Amphibious Warfare**4 Q.H.**

An historical survey of the development of amphibious doctrine and the conduct of amphibious operations. Emphasis is placed on the evolution of amphibious warfare in the twentieth century, especially during World War II. Present-day potential and limitations on amphibious operations, including the rapid deployment force concept, are explored.

Cooperative Education

COP 1135 Professional Development for Journalists

1 Q.H.

(Prereq. Journalism freshmen only)

The course contains current career information in the field of journalism. It is designed to prepare journalism students for the cooperative education experience as well as to introduce them to the academic preparation necessary to pursue a successful career in the journalist profession. The course teaches effective résumé writing, letters of application, and interviewing techniques specifically geared to those who intent to pursue a career in journalism.

COP 1180 Career Decision Making

4 Q.H.

(Prereq. Freshmen or sophomores in any major or permission of instructor)

A life/career planning course designed to meet the needs and concerns of students who may be undecided or uncertain about their academic major or career direction. Activity-oriented classes address the needs of the group, as well as individual participants, and emphasize self-assessment, career exploration, decision making, and goal setting.

COP 1220 Working in the United States

4 Q.H.

(Prereq. International students only)

A career development course for international students in their first-through-third years. The course is designed to help international students compete more effectively for cooperative education positions in the United States and assist them in their cultural transition into the American work force. Topics include work-oriented cross-cultural issues; the American work ethic; skills development; résumé writing; and interviewing techniques.

COP 1314 Life/Career Planning

4 Q.H.

(Prereq. Juniors and seniors in any major, or permission of instructor)

Highly participatory classes focus on career exploration, self-assessment, job-search techniques, and networking. Students are required to prepare a professional résumé, participate in videotaped mock

interviews, research careers, and investigate graduate and professional schools.

COP 1351 Placement Techniques

1 Q.H.

Career selection and development are discussed concurrently with résumé preparation, interviewing techniques, and effective written communication to facilitate the planning and implementation of a professional career program.

COP 1353 Professional Development for Education and Speech-Language Pathology and Audiology

1 Q.H.

An examination of career management issues for fourth year students. Topics include: work and personal values, current issues in the employment market, planning for graduate study, organizing and conducting a job search, advanced résumé preparation, and interviewing techniques.

COP 1356 Career Management in Physical Therapy

1 Q.H.

Career management in physical therapy is examined in view of professional development and career opportunities; other discussions include résumé preparation, communications, and the interview process.

COP 1360 Nursing Career Management

4 Q.H.

The course provides the opportunity for the student to explore traditional and nontraditional nursing careers and education, the world of work, personal and work values, lifestyle, and career management techniques including skills identification, résumé writing, sources of career information, evaluating a potential employer, assertiveness, and selected current issues relevant to nursing careers.

COP 1365 Professional Development for Civil Engineers

4 Q.H.

The course is designed to foster self-assessment skills and to enhance personal and professional growth, as well as to provide a forum for civil engineering students to exchange views on current professional issues and topics.

Interdisciplinary Courses

INT 1100 Introduction to Art, Drama, and Music

4 Q.H.

This interdisciplinary course offers an integrated approach to three related disciplines: art, drama, and music. Basic vocabulary and analytical techniques are established for each discipline, emphasizing such common elements as color, line, rhythm, texture, and form. Representative works from various periods are examined in the context of the cultures that produced them, and lectures focus on parallels and contrasts among the three disciplines' manifestations of specific trends, principles, and ideals. Lectures, readings, and listening assignments are supplemented by

visits to art galleries and attendance at concerts and theatrical performances. (II)

INT 1110 American Musical Theatre

4 Q.H.

This interdisciplinary course, offered by the departments of drama and music, traces the development of the American musical from the *Black Crook* to *A Chorus Line*. The role of musical theatre, both as entertainment and as serious art form, is considered through an examination of script, score, dance, and design. Works by Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter are studied.

INT 1150 Introduction to Women's Studies: Image, Myth and Reality 4 Q.H.

This is an introductory survey of the issues and methodology involved in the interdisciplinary study of women. Such a survey encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in society. Guest lecturers provide an overview of the many different disciplinary approaches to the study of women. This course is required for Women's Studies minors and may be used as either a general elective or, depending upon the discipline of the coordinator, to satisfy specific concentration requirements. (II)

INT 1151, 1152 Women's Studies: Seminars in Research (each) 4 Q.H.

These interdisciplinary Women's Studies seminars allow students to address problems in-depth by researching a topic of particular interest. Careful development of a research plan is encouraged, and opportunities are provided for sharing work-in-progress and for exchanging findings. These courses involve little in-class time, but much consultation with appropriate faculty. The final product of seminar work and research is a major paper. Students in the Honors program may substitute one quarter of honors registration for each seminar, but are still expected to attend the formal sessions of the seminar. These seminars are required for Women's Studies minors.

INT 1161 Introduction to Irish Studies 4 Q.H.

Introduction to Irish Studies is offered from the perspective of a number of fields in one-week sequences: art, business, drama, history, literature, music, politics, and sociology. The purpose of the course is to introduce students to the important forces that have helped to shape contemporary Ireland and Irish-American culture.

INT 1201 An Analysis of American Racism 4 Q.H.

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes, and the manner in which our attitudes, in turn, shape our institutions. Emphasis is on the practical, day-to-day aspects of racism, rather than the theoretical and historical.

INT 1215 Into the Ocean World 4 Q.H.

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but, when appropriate, we focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1216 A History of Seafaring 4 Q.H.

This course surveys maritime transportation, trade, travel, exploration, and warfare from approximately 3500 B.C. to the end of the wooden boat era in the late nineteenth century. Prior to the widespread application

of steam power on land and sea in the nineteenth century, ships were the fastest, safest, and most economical means of transporting large cargoes over long distances. Literary and art history sources are also introduced, along with several films on maritime archaeology.

INT 1217 Water, Water 4 Q.H.

This course is an interdisciplinary introduction to our most precious resource. Water has affected our bodies, our planet, our history, and our culture. How we manage it will shape our future. Because of increasing demand, waste, and pollution, we are depleting—and risk destroying—the limited supply of usable fresh water. This course will look at water through scientific, historical, and cultural viewpoints, and survey contemporary water problems in all their dimensions—political, economic, and technological. (VI)

INT 1320 Exploring the Humanities Through Film

4 Q.H.

The purpose of this interdisciplinary course is to investigate the ways in which the methods of the humanities can expand one's awareness of the sources, statements, and meanings of popular films. Students will see a series of movies and will analyze and evaluate them in the light of readings, the various approaches presented by faculty members from a number of humanistic disciplines, and their own experience.

INT 1330 Field Experience in Human Services I

4 Q.H.

Human services students are required to fulfill two fieldwork placements during the last two years of their program. Placement consists of 150 hours on site and generally varies according to the student's interest. Examples of placement sites include community centers, nursing homes, vocational workshops, state and federal agencies, programs for children, and recreational facilities. Experiences are supervised by University staff to maximize the students' learning opportunities.

INT 1331 Field Experience in Human Services II

4 Q.H.

(Prereq. INT 1330 and Junior or Senior standing)
A continuation of INT 1330.

INT 1333 Senior Seminar in Human Services

4 Q.H.

This course is designed for seniors specializing in human services. The course examines emerging roles and career options within the human services field. Study focuses on self-examination of attitudes and values affecting delivery of services; exploration of ethical issues and dilemmas relevant to human services, grantsmanship and funding issues; staff supervision and development within human services agencies; and refinement of group leadership skills.

INT 1340 Cultural Aspects of International Business

4 Q.H.

(Prereq. Middler standing)
Using a managerial perspective, this course will cover

issues that arise when a firm moves from its home country to a host country that may have a different national culture. Although it will usually take the perspective of the United States-based firm that operates abroad, the course will spend some time on what happens to other national firms operating in the United States and in third-country environments. The way in which "corporate culture" evolves, in the context of national culture and the impact on managers, will be a central issue.

INT 1345 The Olympics **4 Q.H.**

The course examines the Olympics as a total institution. Analysis focuses on the history, philosophy, economics, and politics of the games and how they impact on nations throughout the world. Contemporary problems focused on in this course range from race, sex, and drug abuse, to the use of the Olympics as a stage for international politics.

INT 1346 Women in Sports **4 Q.H.**

The course focuses on the changing relationship of women and their experience in sport. Special reference to the history of women's participation (and lack of it) in sport is presented, as well as, attention to women in amateur and professional and collegiate and precollegiate sports participation. The course will detail these developments within the context of social problems and current trends in American sports.

INT 1400 Professional Practices: Individual and Social Dimensions **4 Q.H.**

The course explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socioeconomic conditions, clients, and other professionals. Case histories are examined to illustrate the dilemmas professionals face, the choices that are typically made, and their consequences on the freedom of the practitioner and on personal and professional integrity.

INT 1401 Health Professionals: Past, Present and Future **4 Q.H.**

This course focuses on the social history of the modern health professions. The course explores long-range patterns in the organization and regulation of the health professions, beginning with the Middle Ages and emphasizing the Jacksonian period, industrialization, modern professional organizations, the growing role of the state, responses of the health professions, and the future of health care in the United States under various corporate-government schemes for reorganizations and "accountability".

INT 1420 Honors Seminar: Survey of the Social Sciences **4 Q.H.**

This course is designed to provide an introduction to important ideas and scholarship in the social sciences for honors students who have completed the freshman year. A two-week period will be devoted to each of the following disciplines: economics, sociology/anthropology, political science, history, and psychology. Topics vary from year to year, depending on the faculty team that teaches the course.

INT 1421 Honors Seminar: Survey of the Natural Sciences **4 Q.H.**

This course is designed to provide an introduction to important ideas and scholarship in the natural sciences for honors students who have completed the freshman year. A two-week period is devoted to each of the following disciplines: chemistry, biology, earth science, mathematics, and physics. Topics vary from year to year, depending on the faculty team that teaches the course.

INT 1422 Honors Seminar: Survey of the Humanities **4 Q.H.**

This course is designed to provide an introduction to important ideas and scholarship for honors students who have completed the freshman year. A two-week period will be devoted to each of the following disciplines: art, music, drama, literature, and philosophy. Topics vary from year to year, depending on the faculty team that teaches the course.

INT 1580 Physical Chemistry with Biological Applications **4 Q.H.**

(Prereq. BIO 1236)

This course examines physiochemical principles as they apply to biological processes. Topics include chemical equilibria, reaction kinetics, basic thermodynamics, oxidation-reduction reactions, bioenergetics, macromolecules in solution, and transport. The approach is quantitative, and problem solving as a tool for learning is emphasized. Basic assumptions and limitations underlying principles are explained; for the most part, however, rigorous derivations are avoided. Applications to basic experimental techniques in biochemistry are made by way of relevant biochemical examples.

INT 2101 Toward Internationalism: Perspectives of Intercultural Understanding **4 Q.H.**

This course will introduce students to the explicit and implicit assumptions which affect the way people think, view themselves, and relate to one another. Through the use of literary, political, philosophical and religious works, and personal accounts, students will be shown how individuals in various contexts come to have different perceptions of how life should be lived. Students will be asked to identify their own assumptions and contrast them against those held in parts of Asia, Africa, and Latin America. Patterns of thinking and intellectual activity, value systems, group dynamics, and the impact of ideology will be explored. "Traditional" and "Modern" patterns will be compared. Students will be introduced to the scope of cross-cultural interaction with a focus on facilitating the understanding and acceptance of differences across lives. This course will be of particular interest to students in professional schools who seek careers in multicultural settings (urban areas in the United States) or in the international setting.

The format of the course will include lectures, discussions, videotapes, and a greater than average emphasis on experiential learning including role-play

and simulation. In particular, students will enact situations taken from other cultures and difficulties in cross-cultural communication. Guest speakers from

various cultural contexts will be utilized to highlight cross-cultural perspectives.

Alternative Freshman-Year Program

The following courses will be offered in the Alternative Freshman-Year Program during the 1986/1987 academic year.

ECN 4100 Economics I

4 Q.H.

Topics include development of macroeconomic analysis; review of national income concepts; national income determination fluctuation and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; and balance of international payments.

MGT 4110 Survey of Business and Management

4 Q.H.

The course offers an introduction to the setting and general structure of American business, the characteristics of private enterprise, and the nature and challenge of capitalism and other forms of economic enterprise. The forms of business, the structure of organization, and the functions of management are discussed in the context of their influence on the various forms of business. Through lecture and class discussion the student is given an overview of the methodologies used in planning, organizing, directing, and controlling the functions of production, marketing, sales, pricing, and finance.

ED 4001 Integrated Language Skills Development I

2 Q.H.

This course strives to improve a student's reading comprehension and related study and language skills. The course devotes time, discussion, and considerable practice to meaning skills such as basic reading comprehension and interpretation, including work in critical reading and other interpretational acts (inferences, understanding imagery, and symbolic usage). Study skills, previewing, finding main ideas and details, outlining and summarizing, continuous interaction, and interaction of all the communications skills—reading, writing, listening, and speaking.

ED 4002 Integrated Language Skills Development II

2 Q.H.

(Prereq. ED 4001)

A continuation of ED 4001.

ED 4003 Integrated Language Skills A

4 Q.H.

This course strives to improve a student's reading comprehension and related study and language skills. The course devotes time, discussion, and considerable practice to meaning skills such as basic reading comprehension and interpretation, including work in critical reading and other interpretational acts (inferences, understanding imagery, and symbolic usage). Study skills, previewing, finding main ideas and

details, outlining and summarizing, continuous interaction, and interaction of all the communications skills—reading, writing, listening, and speaking.

ED 4004 Integrated Language Skills B

4 Q.H.

(Prereq. ED 4003)

Extension of ED 4003, with continued emphasis on study skills, including researching, organizing, and writing term papers. Critical thinking will be explored as it relates to the learning process. The course will also address the choices of academic major and career direction, emphasizing self-assessment and personal decision-making.

ENG 4013 Fundamentals of English I

4 Q.H.

An intensive introduction to the principles of effective expository writing; emphasis on description, paragraph construction, and organization; review of the conventions of English usage, punctuation, and syntax; essay assignments.

ENG 4014 Fundamentals of English II

4 Q.H.

Intensive instruction in exposition, argument, and academic essay writing; instruction in the writing of a research paper; continued emphasis on the conventions of English usage, punctuation, and syntax; essay assignments.

HST 4110 History of Civilization A

4 Q.H.

The major ideas and institutions of civilization from ancient times to 1648.

HST 4111 History of Civilization B

4 Q.H.

A continuation of HST 4110, covering the period since 1648.

MTH 1000 Mathematical Preliminaries I

4 Q.H.

A review of precollege mathematics, primarily arithmetic. Topics covered include operations with numbers, fractions, decimals, percents, and graphs (pictographs, bar graphs, circle graphs, etc.), together with applications of these skills and concepts. The sequel of this course is MTH 1010.

MTH 1010 Mathematical Preliminaries II

4 Q.H.

A survey of precollege algebra, including signed numbers, exponents, multiplication of polynomials, factoring, linear equations, graphing, and radicals. The course is intended for students whose background in precollege algebra is weak.

MTH 1113 College Mathematics for Business

4 Q.H.

Topics include sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic

functions, systems of linear equations, summations, inequalities, permutations and combinations, elementary probability concepts, arithmetic and geometric progressions, simple and compound interest, annuities.

POL 4106 Introduction to Politics

4 Q.H.

A study of the basic political concepts and forces of organization from the classical Greeks to the modern nation-state. The Soviet Union and the United Kingdom are contrasted as contemporary illustrations of the institutional distinction between a totalitarian and a constitutional system.

SOC 4010 Principles of Sociology I

4 Q.H.

An introduction to basic concepts and theories relating to the study of humans as participants in group life. Socialization, culture, social structure, primary groups, family, social stratification, and population are emphasized.

SOC 4011 Principles of Sociology II

4 Q.H.

A continuation of SOC 4010, Principles of Sociology I, with emphasis on critical analysis of American society with particular attention to problems of social, political, urban, and industrial change.

Academic Calendar 1986—87

September 1986

1	Monday	Labor Day. University closed.
8-12	Monday-Friday	Final examinations for Basic Colleges.
15-23	Monday-Tuesday	Division B vacation.
18	Thursday	Fall commencement.
22	Monday	Freshman and transfer students' orientation and University registration.
24	Wednesday	Upperclass registration (Division B) 9:00 a.m.
24-26	Wednesday-Friday	Continuation of course advising, course registration, course drop/add periods, orientation for college day programs.
26	Friday	Burlington Campus orientation and course registration.
29	Monday	Classes begin in Basic Colleges for fall quarter; 8:00 a.m.

October 1986

13	Monday	Columbus Day. University closed.
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November 1986

11	Tuesday	Veterans Day. University closed.
27-29	Thursday-Saturday	Thanksgiving Day recess.

December 1986

15-19	Monday-Friday	Final examinations for Basic Colleges.
22-January 3	Monday-Saturday	Christmas vacation.

January 1987

1	Thursday	New Year's Day. University closed.
5	Monday	Orientation and registration for new freshmen and transfers; registration for continuing September freshmen and returning upperclass students.
6	Tuesday	Registration, orientation and course drop/add continues until 12:00 noon.
7	Wednesday	Classes begin in Basic Colleges for winter quarter; 8:00 a.m.
20	Monday	Martin Luther King, Jr.'s birthday. University closed.

February 1987

19	Monday	President's Day. University closed.
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March 1987

23-27	Monday-Friday	Final examinations for Basic Colleges.
30-April 4	Monday-Saturday	Division A vacation.

April 1987

6	Monday	Orientation and registration for transfers and continuing freshmen and returning upperclass students.
7	Tuesday	Registration, orientation, and course drop/add continues until 12:00 noon.
8	Wednesday	Classes begin in Basic Colleges for spring quarter; 8:00 a.m.
20	Monday	Patriots' Day. University closed.

May 1987

25	Monday	Memorial Day. University closed.
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June 1987

15-19	Monday-Friday	Final examinations for Basic Colleges.
21	Sunday	Commencement.
22-27	Monday-Saturday	Division B vacation.
29-30	Monday	Registration for Division A and D and January freshmen (Quarter 3). Beginning of summer quarter.
30	Tuesday	Basic College classes begin for summer quarter; 8:00 a.m.

July 1987

4	Saturday	Independence Day. University closed.
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September 1987

7	Monday	Labor Day. University closed.
8-11	Tuesday-Friday	Final examinations for Basic Colleges.
14-22	Monday-Tuesday	Division A vacation.
17	Thursday	Fall commencement.
21	Monday	Beginning of 1987-1988 academic year. New student orientation week. Registration and advising week for all returning upperclass students and all new students.
28	Monday	Classes begin for Basic Colleges for fall quarter; 8:00 a.m.





1986-1987
Northeastern University Bulletin





1986–1987

Northeastern University

Basic College Bulletin

College of Arts and Sciences
Boston-Bouvé College of
Human Development Professions
College of Business Administration
College of Computer Science
College of Criminal Justice
College of Engineering
School of Engineering Technology
College of Nursing
College of Pharmacy and
Allied Health Professions
University College
(Alternative Freshman-Year Program)

The Northeastern University *Bulletin* (USPS 989-040) is published by Northeastern University at 360 Huntington Avenue, Boston, Massachusetts 02115, five times a year; once in January, once in August, once in September, and twice in October. Second-Class Postage Paid at Boston, Massachusetts, and at additional mailing offices. Volume XIV, Number 2, August 30, 1986.

POSTMASTER: send address changes to:
Northeastern University *Bulletin*
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

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A Message from the President

We find ourselves in the midst of a cultural revolution with effects as profound as those of the industrial revolution. At an ever-increasing pace, we are being propelled into an information age that is shaping our world. The challenge facing colleges and universities is to adapt their value systems to the sweeping impact of information technology. We must find a way to move forward while holding fast to the wisdom of the past.

Northeastern University is a model for the modern university. We are constantly evolving to reflect the changes in our society. We recognize education as the preparation for life and the intelligent appreciation of life. The common theme of our programs is the combination of the quest for knowledge with the forging of a productive career path. The Cooperative Plan of Education, the cornerstone of Northeastern's national and international reputation for the last seventy-six years, is our way of effectively coupling these objectives. By integrating learning with the demands of living, cooperative education enables students to understand the importance of continued learning throughout their lives.

At Northeastern, a practical approach to higher education does not diminish our emphasis on academic life. We offer a broad spectrum of programs spanning professional fields and the liberal arts. Our distinguished faculty have traditionally emphasized excellence in teaching as a professional goal. They are dedicated to pursuing innovative scholarship and generating new knowledge through research in areas as diverse as cancer detection, artificial intelligence, laser technology, and language and cognition.

As an urban university located in the heart of Boston, one of America's richest cultural environments, Northeastern University is a dynamic and exciting place at which to study. The entire city is part of our "extended campus." By taking advantage of the University's many and diverse programs, the Cooperative Education Plan, and the resources of our surroundings, Northeastern students have a unique opportunity to achieve well-rounded intellectual, cultural, and social development.

Kenneth G. Ryder
President



Cooperative Education

An Education That Works

Cooperative education is based on the principle that what students learn in the workplace is just as valuable as what they learn in the classroom. By combining work and study, students gain greater insight into each.

At Northeastern University, cooperative education is given such a high priority that it is considered a degree requirement for most programs. The University makes every effort to plan and carefully structure student work assignments. It also attempts, whenever possible, to integrate students' work experiences into their academic work. But the University cannot do it alone. A student's interest and enthusiasm play a crucial role in determining the quality of co-op experiences. The success of the program, then, depends upon the cooperation of educators, students, and outside agencies to produce an integrated and relevant program.

Studies have shown that the reinforcement of classroom learning by job responsibilities increases a student's motivation and self-confidence as well. Greater interest in academic work develops when students see the relation between co-op work and the principles they study in the classroom. Not only are co-op students able to evaluate career decisions early in their college years, they also gain meaningful work experience before graduation and establish professional contacts and references.

Finally, the salaries students earn on co-op assignments help defray tuition, room and board, books, and other expenses.

The Department of Cooperative Education

Paul M. Pratt, M.Ed., *Dean*

Richard E. Sprague, M.B.A., M.Ed., C.A.G.S., *Assistant Dean*

Kathy Sharkey-Jordan, M.Ed., *Assistant to the Dean*

Professors

Nancy J. Caruso, M.Ed.

George K. Howe, M.Ed.

Robert W. Miller, M.Ed.

Associate Professors

Boreslaw P. Berestecky, M.Ed.

Betsey W. Blackmer, P.T.,
M.Ed.

Richard L. Canale, M.Ed.,
C.A.G.S.

Elizabeth A. Chilvers, M.Ed.

Mark I. Conley, Jr., Ed.D.

Robert D. Deforge, R.Ph.,
D.Ph.

Philip W. Dunphy, M.Ed.

Mary R. Flynn, R.N., M.Ed.

Stephen M. Kane, Ed.D.

Gerard J. Lavoie, M.P.A.

Homer C. Littlefield, B.S.

Judith A. Moll, M.S.

Anthony R. Rotondi, M.Ed.

Willie Smith, Jr., M.Ed.

Roderic W. Sommers, M.Ed.

Hugh J. Talbot, M.P.A.

Assistant Professors

Michael A. Ablove, M.Ed.

Mary M. Doolan, B.S.

Donald L. Eastridge, M.Div.

Jean F. Egan, M.Ed.

Kathleen L. Finn, R.N., Ed.D.

Theresa A. Harrigan, M.Ed.

Charles R. McIntyre, B.S., B.A.

Peter J. Mollo, M.Ed.

John C. Mulhall, M.S.

Ann C. Noonan, P.T., M.Ed.

Veronica Leona Porter, M.Ed.

Melvin W. Simms, Ed.D.

William A. Sloane, M.B.A.

Gary M. Somers, M.A.

Robert R. Tillman, M.Ed.

Instructors

Joyce K. Fletcher, M.Ed.

Louis V. Gaglini, M.P.A.

The Department of Cooperative Education administers the cooperative education programs for all undergraduate programs in the Basic Colleges and the graduate programs in Engineering.

Participation in the Cooperative Plan of Education is required of all students in the Basic Colleges except those in the College of Arts and Sciences. Although most Arts and Sciences students choose to take advantage of co-op, the college offers a full-time program in which eight quarters of upperclass study may be completed in three years.

Cooperative education curricula leading to the baccalaureate degree require five years at Northeastern University. Programs consist of a freshman year of three consecutive quarters of full-time study followed by four upperclass years in which students alternate periods of classroom attendance with cooperative education assignments.

Students are assigned a faculty coordinator-counselor team which is responsible for all phases of their cooperative program and which assists them in deriving greater value from their education at Northeastern. Personal interviews provide the basis for referral to specific opportunities that help students realize career objectives. The Department of Cooperative Education keeps abreast of activities in specific areas in order to provide counseling on opportunities and trends. In general, co-op assignments become increasingly professional as the students' education and abilities grow.

Students may wish to participate in an activity other than paid employment during a cooperative period. They may wish to travel abroad, to volunteer their services, or to take specialized courses at another institution. Students may arrange time for these special activities with their coordinators.

Further details on the cooperative program are available in a booklet entitled *Co-opportunities*, which the Department of Undergraduate Admissions will be happy to send you on request.

International Cooperative Education

Robert E. Vozzella, M.A., C.A.G.S., *Director*

The International Cooperative Education Office offers a wide variety of services to domestic as well as international students. Through the International Exchange Program, qualified undergraduates are afforded the opportunity to be placed abroad for their cooperative work experience. Placements are currently available in the United Kingdom, Ireland, France, Germany, Sweden, Canada, and Israel for students whose academic, linguistic, and professional experience make them appropriate candidates for positions abroad.

International students may receive assistance on matters relating to their co-op employment, such as social security and tax information, as well as issues involving the verification of their immigration and co-op status.

The course, "Working in the United States," which has been expressly created to meet the needs of undergraduate international students, is taught by the staff of the International Cooperative Education Office. It is designed to assist such students to compete more effectively for domestic cooperative education positions and to facilitate their adjustment into the American work force.

New co-op programs currently are being developed in the home countries of international students where the economic and social conditions render such undertakings possible. Limited opportunities with various American multinational corporations are available for students majoring in engineering, computer science and business administration.



The Urban University

Campus Highlights

Northeastern University, located in the heart of historic Boston, stands at the center of an area of cultural and educational diversity. Such institutions as Symphony Hall, Horticultural Hall, New England Conservatory of Music, Boston YMCA, the Museum of Fine Arts, Roxbury Community College, and Wentworth Institute are all within a fifteen-minute walk from the campus. In addition, the Fenway area, noted for its beautiful rose garden and bicycling and jogging paths, as well as Fenway Park, is only ten minutes away.

The campus is made up of some fifty-two buildings in an area of fifty-five acres. The buildings are organized in a formal grid, creating a series of rectangular courtyards and open corridor spaces. The straight, functional lines of the more centrally located buildings are the dominant theme of the campus architecture and reflect the urban environment in which the campus is located. The somewhat austere look of these structures is relieved by the extensive landscaping throughout the campus.

The “front door” to the campus is the recently landscaped Quadrangle. The “Quad” faces Huntington Avenue, a major thoroughfare that divides the academic buildings in the southern portion of the campus from the dormitories in the north, and provides convenient public transportation to downtown Boston as well as other areas in the city. In addition, the Quad is the nucleus of some of the University’s original architecture, including the Dodge Library, Richards Hall, home of many of the University’s administrative offices, and the Ell building with its student center and newly renovated auditorium.

The campus itself has been planned to provide freedom of movement within the central academic area and dormitory area as well as the athletic facilities and parking areas located on the periphery of the campus. This access has been provided through a series of interconnecting walkways and secondary streets that run throughout the campus. In addition, a network of underground corridors connects many of the buildings, providing routes that are especially convenient during periods of inclement weather.

As the University continues to expand, new and renovated buildings are being added to the central academic area, and parking and recreational areas relocated on the periphery of campus. One such new building is the architecturally dramatic addition to the School of Law. Constructed half below grade, this one-story structure opens into a sunken garden and boasts a landscaped plaza on the roof. The plaza is a focal point and gathering spot for the west campus area, which is also the location of the University’s newest housing facility. Adjacent to this site stands the recently constructed Kariotis Hall, a semicircular classroom building.

Cullinane Hall houses Northeastern's newest college, the College of Computer Science. This structure was the University's oldest building, but with complete renovation, it now provides the stimulating environment so necessary to learning, teaching, and research.

Matthews Arena, located on the periphery of campus and soon gaining access to a new subway station, was once known as the oldest indoor ice-hockey arena in the United States. With extensive renovations completed, it is now devoted to hockey and collegiate sports as well as men's and women's varsity basketball. With two and a quarter million dollars invested in its renovation, the Arena is now an architectural jewel and not only meets the needs of Northeastern but the surrounding community as well. It supplements the athletic and recreational facilities available to Northeastern students in the Cabot-Barletta gymnasium complex.

Recent new construction includes Snell Engineering Center, a building that accommodates the departments of Industrial Engineering and Information Systems, Civil Engineering, Chemical Engineering, and Mechanical Engineering and the School of Engineering Technology. The Snell Center adjoins the Dana Research Center, home of the departments of Physics and Electrical and Computer Engineering, creating an impressive academic complex.

Future expansion includes construction around a second and new "front door" on the southwest border of the campus. In that area, a public transit line will be relocated on the right-of-way of an old railroad line. The new Ruggles Street subway station will be located on this line at Northeastern and will coordinate local bus routes and a suburban commuter rail line.

Located at this new "front door" is the Ruggles Building. Once an old mill building, extensive renovation now provides general classrooms and studio space for the three divisions of Fine Arts as well as new administrative office space. Shortly, the construction of a central University library and a parking garage will begin in this developing area of the campus.

Boston, the "Extended Campus"

It is no accident that one out of every five Massachusetts students chooses Northeastern University for his or her college education. In addition to its innovative system of cooperative education, Northeastern's "extended campus" of Boston attracts students who want to take advantage of the many opportunities this world-class city offers.

Located throughout metropolitan Boston, many of America's leading corporations and institutions provide Northeastern students with meaningful co-op assignments. Their offices and laboratories become classrooms for students who want to participate in the world of work first-hand. Co-op employers help them gain the knowledge and judgment for a head start in launching their careers and the foundation on which to build them.

For those who want to see the eclectic blend of historic and contemporary Boston, there are the exciting shops and restaurants of Boston's nationally famous Quincy Market and the new Copley Place. Alongside the bustle of Haymarket in the North End, the ancient tradition of Chinatown, and the grace of the Public Garden is the strikingly bold architecture of Government Center, Copley Plaza, the State House, and the Christian Science Center. The John Hancock Observatory and the Prudential Skywalk offer excellent views of Boston, old and new.

Among the hundreds of cultural attractions in Boston are the Museum of Fine Arts and Symphony Hall, both adjacent to the Northeastern campus. The former provides free admission to its permanent collections and special international exhibitions for more than 16,000 Northeastern undergraduates. Also neighbors of Northeastern are the Isabella Stewart Gardner Museum, the Institute of Contemporary Art, the New England Conservatory of Music, the Christian Science Center, and the Boston Public Library. A short ride on mass transit brings students to the Museum of Science, Hayden Planetarium, and the theatre district.

The home of more than sixty colleges and universities, greater Boston offers an ever-changing kaleidoscope of academic enrichment. Within walking distance of Northeastern are the Massachusetts Institute of Technology, Boston University, Simmons College, Emmanuel College, Massachusetts College of Art, and Harvard Medical School. Also close by are Boston's world-renowned hospitals and their affiliated research facilities.

Best known as the birthplace of the American Revolution, Boston attracts thousands to the historical landmarks of its Freedom Trail every year. Among them are Paul Revere's House, the U.S.S. Constitution ("Old Ironsides"), Faneuil Hall, Beacon Hill, and the Boston Common. In recent years, a Harborwalk has introduced thousands more to the exciting sights on the Boston Waterfront, including the Boston Tea Party Ship and Museum.

Boston revels in the competition of its professional sports teams—the Red Sox, Celtics, Bruins, and Patriots—and Northeastern students join in the excitement at Fenway Park, Boston Garden, and Sullivan Stadium. Each spring, runners from all over the world come to Boston to participate in the Boston Marathon—the granddaddy of them all. In addition, the Charles River and the slopes of northern New England tempt Northeastern students with some of the best crewing and skiing in the country.

The list of professional, historical, cultural, educational and recreational opportunities in Boston goes on and on. Although many of them are within walking distance of Northeastern, many others are easily accessible by mass transit, which stops directly in front of the University. Northeastern, in partnership with many of the city's most prestigious institutions, encourages students to explore these opportunities to the fullest.

Visitor Information

David Flanagan, B.S., M.P.A., *Director*

The Visitor Information Center, located in 115 Richards Hall, provides information and a number of services to visitors to Northeastern University. The University map; *A Guide to Northeastern University*; *All Roads Lead to Northeastern University*; the *Northeastern Alumni Magazine*; the *Northeastern Edition*; and other Northeastern catalogs, pamphlets, and brochures are all available at this convenient, central location. At the Visitor Information Center, staff members answer questions, give directions, and provide friendly and accurate advice about the University and its programs to visitors, students, staff, and faculty. Visitors to Northeastern may request a University visitor pass, which entitles them to a number of special services and premiums, including an information kit, discounts at the University Bookstore and University events, complimentary posters, and free passes to the nearby Museum of Fine Arts. MBTA and suburban bus schedules are also available. With a 24-hour notice, visitors or their sponsors may request parking reservations by writing or calling the Visitor Information Center at 617-437-2736. The center serves as a clearinghouse for all commuter information pertaining to car or van pools. A notary public service is also available from 8:30 a.m. to 4:30 p.m., Monday through Friday. For an up-to-the-minute recorded listing of University activities and events of interest to the general public and the University community, call the Northeastern University events line at 617-437-3281.

Hours

Monday–Thursday	8:00 a.m.–8:30 p.m.
Friday	8:00 a.m.–6:00 p.m.
Saturday	8:00 a.m.–1:00 p.m.



Academic Programs

Quarter-Hour Credits

Northeastern University operates on a quarter-system calendar. All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit.

Classes at Northeastern are scheduled in different modules.

In assessing quarter-hour weights for courses, the following statement applies:

One quarter hour of credit is three hours of student learning time per week, usually one hour of lecture or discussion plus two hours of individual study time, over a quarter.



College of Arts and Sciences

J. Edward Neighbor, Ph.D., *Acting Dean and Director of Graduate School*

Robert E. Fuller, M.A., *Assistant Dean, Minority Student Services*

Mary Mello, M.A., *Director of Academic Administrative Services*

Joan F. Drexelius, Ph.D., *Assistant to the Dean, Minority Student Services*

Gail F. Leclerc, M.Ed., *Undergraduate Student Counselor*

Suzanne E. Marchand, M.A., *Coordinator of Graduate Student Services*

Suzanne L. Robblee, M.A., *Assistant to the Dean (Special Programs)*

Paula L. Sossen, Ed.M., *Coordinator of Undergraduate Student Services*

Program Aims

Studies in a broad distribution of disciplines in arts and sciences are universally regarded as the core of higher education. For this reason, nearly all students in the University—no matter what disciplines they choose for their career training—devote a substantial portion of their studies to the arts and sciences.

The College of Arts and Sciences comprises a wide variety of programs spanning an enormous range of human knowledge and activity. These programs are grouped informally into divisions as follows: (1) Fine Arts, (2) Humanities, (3) Natural Sciences, including Mathematics, and (4) Social Sciences. The College as a whole emphasizes the general education of students; within each division, the disciplines tend to offer a common preprofessional orientation and emphasis.

In addition, the College offers a large number of interdisciplinary programs as well as extradisciplinary opportunities for the enrichment of learning. These are grouped into a Division of Special Programs. The division includes exchange programs with other institutions, both nationally and internationally, for employment and/or study; programs for extended studies in field settings at sea and abroad; and cultural programs involving affiliations with professional performing arts organizations—to name a few. These programs are described at the end of the Arts and Sciences section of this *Bulletin*.

Graduates of the College find they are prepared for a multitude of employment opportunities in all walks of life. Many choose to accept employment directly, following receipt of the bachelor's degree. Others choose to continue their training by going on to graduate-level studies, for example, in business, law, or medicine. Others decide to pursue advanced study in an area closely related to their undergraduate field.

Four- and Five-Year Programs

In all programs, students of the College have the option of choosing a four-year, full-time track or the five-year Cooperative Plan of Education. The five-year plan offers opportunities for regular “real world” employment and income in an area often related to the chosen area of academic work. Students are normally eligible to participate in the Cooperative Plan when they achieve sophomore status.

Major Programs

Entering students are invited to express a “major preference” for one of the major programs, and this, together with the core curriculum requirements of the College, determines the course of studies in the first and second years. There is considerable flexibility, however, and students often change their preferences during this period. Formal certification of the major choice, accomplished by submission and approval of a petition, normally takes place at the beginning of the third year, when the transition to the “upper division” of the College occurs.

Students entering the lower division of the College may later wish to petition for transfer to the upper division of the College of Business or the College of Computer Science. Arts and Sciences freshmen with this intention should indicate “Business” or “Computer Science” as the initial major preference on the application.

Students in the College may earn either a bachelor of arts degree or a bachelor of science degree. However, students majoring in human services or in music may earn a bachelor of arts degree only. Students majoring in applied physics or in political science with a concentration in public administration may earn only a bachelor of science.

Honors Program

The College of Arts and Sciences participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

Advising and Placement

Upon acceptance to the College, students are placed into freshman and sophomore courses designed to suit their abilities, needs, and prospective major affiliations. The placement process involves close consultation between students and faculty advisers from the major programs.

The particular studies advised for freshmen fall into several placement categories, as follows: (1) honors, (2) regular, (3) regular with modification, and (4) special. The latter two categories give students the opportunity to undertake studies in skill development to improve their chances of success in college. These placements are determined by faculty, subject to review by consultation during Orientation Week, before classes start in the fall quarter. Continued monitoring and mentoring by faculty and/or staff advisers in the lower division years aid students in appropriately preparing to enter their major fields of study as upper-classmen.

Faculty guidance is also available to upper-class students for maintaining satisfactory academic standing and gaining entry by petition to a major field of study. After the major choice is certified, students are formally affiliated with their department, its faculty, and other students in the same major.

The Arts and Sciences Dean's Office, located in 403 Meserve Hall, is the central administrative office for all students majoring in Arts and Sciences programs. In addition to the faculty advisers located in the various departments, the Dean's Office counselors are available to all students for academic assistance. The Dean's Office staff works closely with faculty advisers to help the student work out a program of study and to take care of any problems that may arise relating to administrative procedures. The Dean's Office is open from 8:30 to 4:30, Monday through Friday, during the fall, winter, and spring quarters, and from 8:00 to 5:30, Monday through Thursday, during the summer. The phone number is 437-3980. Students are encouraged to seek counseling from faculty advisers in departments of major preference or affiliation, or from counselors in the Dean's Office, whenever necessary.

Student Services**The Writing Center**

The Writing Center offers free one-to-one tutoring in writing to all students, faculty, and staff. It offers a complete approach that provides the opportunity for clients to learn how to find a topic, gather ideas about a topic, develop and organize ideas, revise, edit, and proofread writing in any subject. The Writing Center is open Monday through Friday from 9:00 a.m. to 4:00 p.m. Clients may either drop in or sign up for help in 102 Cahners Hall. For further information, call 437-2328 or stop by 102 Cahners Hall.

The Math Center

The Math Center is located in Cahners Hall. It provides free one-to-one assistance for students enrolled in algebra review courses and in introductory and advanced mathematics courses. Instructional assistants offer help in clarifying concepts, explaining methods, checking homework, and studying for tests. The center is open Monday through Friday from 9:00 a.m. to 4:00 p.m. for students in algebra review courses and introductory math courses (through calculus III). Students may sign up for appointments in 102 Cahners Hall. Advanced course students may drop in on Tuesdays and Thursdays, from 1:35 to 4:00 p.m., for help on a first-come, first-served basis.

Program Descriptions and Regulations

The following pages briefly describe each major in the College of Arts and Sciences. Within each division of the College, the majors are listed in alphabetical order. Summaries of the divisions can be found on the following pages: Fine Arts, page 21; Humanities, page 28; Natural Sciences and Mathematics, page 40; Social Sciences, page 56.

A summary of the Special Programs in the College can be found on page 78. Following this is a brief description of each of these programs, listed in alphabetical order.

Finally, a summary of general College graduation requirements can be found on page 93. For a more complete account of the Arts and Sciences' program regulations, students should consult the various College publications available in the Dean's Office.

A complete listing of individual courses offered by the College, including a short description of contents for each course, is given in the *Basic Day Colleges Course Descriptions and Curriculum Guide*, obtainable from the Registrar's Office.

Fine Arts Division

To try to define the boundaries of an academic discipline is to invite controversy. This is nowhere more true than in the arts. However, one can say that the term “arts,” used without qualification (as in “Arts and Sciences”), refers to such disciplines as languages, literature, and philosophy that are presumed to develop general intellectual ability and judgment and provide information of general cultural concern.

Education in the arts is thus distinguishable from education in the sciences—which emphasizes knowledge of objective facts and laws—and especially from narrowly practical training, as for a particular profession such as law or medicine.

The term “Fine Arts” refers specifically to those disciplines concerned primarily with works produced or intended for beauty rather than mere utility. Thus, the term includes (but is not limited to) activities such as sculpture, painting, and drawing, as well as architecture, drama, music, and the dance.

In the College of Arts and Sciences, the major disciplines comprising the Fine Arts Division are as follows:

Art and Architecture page 21

Music page 24

Theatre and Dance page 25

Department of Art and Architecture

Peter Serenyi, Ph.D., *Professor and Chairman*

Professor

Robert L. Wells, M.A., M.F.A.

Associate Professors

Samuel S. Bishop, M.A., M.F.A.

Wheaton A. Holden, Ph.D.

Assistant Professors

Renée LeWinter, M.A.

T. Neal Rantoul, M.F.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The visual arts, our oldest form of artistic expression, offer an understanding of humanity and the cultural forces that have affected us historically. Moreover, as visual communication becomes more widespread in the contemporary world, the use and understanding of visual language must be seen as a necessary part of the educational process.

In view of this, the aim of the department is threefold: (1) to introduce art and architecture both as history and as creative activity in the context of a broad liberal arts education; (2) to offer

a more focused study of the visual arts through a critical examination of both the language and content of art and architecture in the context of a particular historical period, or through the hands-on experience of a studio setting; and (3) to provide an opportunity for a solid academic foundation to those who wish to pursue a career in art and architecture, or related fields.

One of the main resources of the department is Boston itself, whose architecture spans three hundred years, whose museums are world famous, whose galleries and cinemas offer the latest in their respective areas, and whose public library is one of the best of its kind. Learning to use these resources systematically is an all-embracing aim of the department.

Professional Preparation

The department offers preprofessional preparation for students interested in pursuing a career in architecture, graphic design, photography, and the teaching of the history and practice of art.

The Major

The department offers a general major in art and three concentrations within the major: (1) history of art and architecture, (2) studio art, and (3) architecture.

Courses in the history of art and architecture cover the major periods of the Western world from ancient to modern, with a focus on nineteenth- and twentieth-century Europe and America.

The studio concentration includes painting, drawing, graphic design, printmaking, architecture, film, and photography. Studio courses are complemented by courses offered in the theory and criticism of these art forms. The best work created in the studio courses is exhibited in the annual student show at the University Art Gallery.

The architecture concentration consists of courses in the history and theory of architecture and architectural design. Most design courses are offered at the Boston Architectural Center at 320 Newbury Street, Boston. (See Special Programs section, page 80.)

The departmental requirements for the general major in art are the two-part survey course in art history, twelve electives in art and/or architecture, plus one music elective; one theatre and dance elective; and one elective from history, psychology, or philosophy. (The College also requires a Core curriculum for both B.A. and B.S. students. See page 94.)

The departmental requirements for the three concentrations are:

1. *History of Art and Architecture*: same requirements as for the art major, except for the twelve art electives, which are replaced by eight history of art and architecture courses and six studio courses.
2. *Studio Art*: same requirements as for the art major, except for the twelve art electives which are replaced by ten studio courses and four art history courses.
3. *Architecture*, in collaboration with the Boston Architectural Center and leading to a B.S. degree (a preprofessional degree): same requirements as for the art major, except for the twelve art electives which are replaced by six architectural history courses; six architectural design courses; four art studio courses; four building technology and management courses, and five math/science courses.

With prior approval, art courses not offered by the department may be taken in one of the neighboring art schools or universities.

Students may pursue either a four-year full-time program or a five-year cooperative plan of study. Transfer from one to the other is possible, and registration in either can be reversed. Cooperative education work assignments include positions in museums, libraries, historical collections, archives, architectural firms, and the Northeastern University Art Gallery.

The Minor

The department offers a minor program for students majoring in other fields of study. The program consists of a general minor and the following four concentrations: history of art, history of architecture, photography, and studio art. The number of courses required for the minor does not exceed seven. Students interested in the minor program should consult the department chairman.

Special Programs

See Asian Studies Minor, Boston Architectural Center Affiliation, Division of Fine Arts, Humanities Center, Independent Major, Irish Studies, Media Studies Minor, International Co-op, and New England Conservatory Affiliation, in the Special Programs section, page 78.

Department of Music

Joshua R. Jacobson, D.M.A., *Associate Professor and Chairman*

Professors

Reginald Haché, Art. Dip.
Roland L. Nadeau, M.M.
Judith Tick, Ph.D.

Associate Professors

Robin Hendrich, Ed.D.
David Sonnenschein, D.M.A.

Assistant Professors

Kenneth P. Ayoob, D.M.A.
Ernest D. Brown, Ph.D.
Julia A. Griffin, Ph.D.
Dennis H. Miller, D.M.A.

Lecturers

Robert Ceely, M.A.
Douglas Durant, M.F.A.
George F. Litterst, M.M.
Charles Mokotoff, M.M.
Edmond J. Moussally, M.M.
Karen L. Pokross, Ed.M.

Degree Offered: Bachelor of Arts

Music speaks directly to the soul. The experience of the masterworks of the musical art is one of the cornerstones of a humanistic education.

The primary aim of the Department of Music is to foster the aesthetic appreciation of music by giving students the opportunity to gain the knowledge and skills necessary to understand and intelligently evaluate a musical composition.

Courses are offered in the areas of general appreciation, music theory, the history of music (both Western and non-Western), applied music lessons, and aspects of the music industry. Performing ensembles directed by full-time music faculty provide the opportunity for students to experience first-hand the music which they have studied in the classroom. Furthermore, an extensive concert series offers a varied program of performances on campus by faculty, students, and guest artists.

Professional Preparation

A major in music offers students the opportunity to prepare themselves for a wide range of professions, including performance, teaching, church music, arts administration, composition, music therapy, broadcasting, and studio production.

The Major

The Music Department offers a variety of options for the prospective musician. While the core of the program is the study of music, students can concentrate in a variety of sub-specialties such as world music, African-American music, music and technology, the music industry, music therapy, and performance.

The music major is divided into two areas. In the first area, the historical development of the great music literature of Western civilization is traced. The second area is comprised of a series of theory courses encompassing ear-training, keyboard skills, and

analytic techniques. Students have use of Northeastern's modern facilities, which include a piano laboratory and a fully-equipped listening center.

For the B.A. degree program in music, students must complete four courses in music theory, five courses in music history, one course in keyboard proficiency, and two courses in musical analysis. Students must take a minimum of three electives in music, as well as three courses in Western civilization, art, and drama. The remainder of the student's course work is selected from a broad base of electives in the College Core Curriculum.

The Minor

The department offers a minor in music for students majoring in other fields of study. The program consists of three courses in music theory, two courses in music history, one course in keyboard proficiency, and one elective in music.

Special Programs

See New England Conservatory, Boston Lyric Opera, Division of Fine Arts, Humanities Center, Independent Major, League of Composers—International Society for Contemporary Music, and International Co-op in the Special Programs section, page 78.

Department of Theatre and Dance

Mort S. Kaplan, M.A., *Professor and Chairman*

Professor

Eugene J. Blackman, M.A.

Associate Professors

Janet L. Bobcean, M.F.A.

Jerrold A. Phillips, Ph.D.

Assistant Professors

L. Stacy Eddy, M.F.A.

James J. Moran, M.F.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Theatre, one of the most ancient of all art forms, is still a moving force in our society because it uniquely involves both the performer and the spectator to a degree unmatched by other creative and communicative arts.

Professional Preparation

At Northeastern, students in the Department of Theatre and Dance have the opportunity to enroll in a program of study that provides a balance between theory/history/literature courses and studio rehearsal and performance work. The curricula provide the student with the opportunity to obtain the background for advanced study on a graduate level or for a career in the professional theatre.

The undergraduate theatre major will be introduced to the total theatre experience. A diverse core program, consisting of twelve courses, is designed to develop understanding of the essentials necessary as a foundation upon which to elect one of the following seven concentrations: acting; scenic design; costume design; lighting design; literature/criticism; dance, performance, and choreography; or generalist.

The classroom and stages are viewed as laboratories where theory is tested in rehearsal and performance. To enrich the means of performance, the facilities and faculty of other art departments—music and art and architecture—are drawn upon. Theatre majors are encouraged to express individual creative and interpretative impulses, and with the support of a faculty adviser are often able to perform a variety of projects of their own initiation in areas of acting, directing, playwriting, design, or performance art.

The difference between the B.A. degree and the B.S. degree is one of flexibility and concentration. The B.S. degree allows the substitution of specialized field courses for certain of the College's general and language requirements.

Besides completing the required courses offered by the College of Arts and Sciences toward a degree program, and before focusing on further course work within any particular concentration, all majors in all concentrations except dance must complete forty-eight quarter hours of the departmental core, which includes such courses as Introduction to Acting, Concepts of Directing, Stagecraft, Introduction to Theatre Design, and Introduction to Theatre Arts. Theatre majors with a dance concentration, before focusing on further course work within this concentration, must complete a core of forty-seven quarter hours. In addition to various technique classes in ballet, jazz dance, modern dance, and choreography, the following are just some of the courses in the core of the dance concentration: Dance in the Twentieth Century, Anatomy/Physiology, Kinesiology, and Dance in Cultural Perspective.

All students majoring in theatre are expected to work in production each quarter in residence and fulfill a variety of crew assignments in construction, painting, sound, lighting, costuming, and box office work, as well as crew assignments for the running of a show. Whenever possible, majors are expected to serve as stage managers and assistant stage managers. Appearing in a production is not a substitute for crew work, and all those concentrating in a performance aspect must also participate in crew activities.

It is necessary that theatre majors maintain a regimen of physical conditioning. During each of the quarters in residence, the following courses, when available, are recommended: Modern Dance, Ballet, Jazz Dance, Tumbling, Gymnastics, Fencing, and Physical Conditioning.

The Minor

Students majoring in other departments may choose a minor in theatre to complement their academic majors or to assist them in developing career goals by taking eight courses (thirty-two quarter hours). Closely supervised by a departmental faculty adviser, students may follow programs of study that offer a generalized or a specialized program. Specialized areas are in acting, scenic design, costume design, lighting design, and literature and criticism.

Accreditation

Basic course work offered by this department adheres to the suggested minimum requirements for a theatre degree as put forth by the American Theatre Association and enables the diligent student to prepare for the graduate placement examination in theatre.

Special Programs

See the Division of Fine Arts, Humanities Center, Sports and Leisure Studies, Film Studies, Irish Studies Minor, Asian Studies Minor, American Sign Language, and International Co-op in the Special Programs section, page 78.

Humanities Division

The humanities are those disciplines concerned with human beings and their cultures, especially subjective aspects of cultures which invest life with meaning and value. Examples are the disciplines of languages and literature, and philosophy and religion.

The humanities are distinguished from the social sciences, which tend to focus on objective aspects of societies and on individual relationships in, and to, society. This distinction, however, is helpful only if used with reservations. Most humanistic disciplines do not neatly conform to one simple description or the other.

In the broadest terms, of course, the humanities can be viewed as encompassing the fine arts. Since a sense of aesthetics is among the most basic of human values, all cultures are centrally concerned with issues of form and beauty.

In the College of Arts and Sciences, the major disciplines comprising the Humanities Division are as follows:

English page 29

Journalism page 31

Modern Languages page 33

Philosophy and Religion page 35

Speech Communication page 37

Department of English

Kinley E. Roby, Ph.D., *Professor and Chairman*

Professors

Samuel J. Bernstein, Ph.D.
Robert J. Blanch, Ph.D.
Francis C. Blessington, Ph.D.
Irene Fairley, Ph.D.
Gary Goshgarian, Ph.D.
Earl N. Harbert, Ph.D.
Victor E. Howes, Ph.D.
M. X. Lesser, Ph.D.
James E. Nagel, Ph.D.
Jane A. Nelson, Ph.D.
Guy Rotella, Ph.D.
Herbert L. Sussman, Ph.D.
Arthur J. Weitzman, Ph.D.
Paul C. Wermuth, Ph.D.
Joseph E. Westlund, Ph.D.

Associate Professors

Timothy R. Donovan, Ph.D.
Gerald R. Griffin, Ph.D.
Stuart S. Peterfreund, Ph.D.
Lloyd A. Skiffington, Ph.D.

Assistant Professors

Richard Bullock, Ph.D.
Janet Randall, Ph.D.
Michael Ryan, Ph.D.
Charles H. Sides, Ph.D.
Kristin Woolever, Ph.D.

Lecturers

Joseph deRoche, M.F.A.
David Tutein, M.A.

Continuing Lecturers

Beth I. Bennett, M.A.
Vicki Casana, M.A.
Faye F. Firnhaber-Cudmore, M.A.
Paul Gallagher, M.Ed.
Susan Goldwitz, M.A.
Joseph L. Iacovella, M.A.
Constance Leigh, M.A.
Ronald MacKay, M.A.
Robin McCormack, M.A.
Eileen Mills, M.A.
Virginia C. Parsons, M.A.
James E. Poulos, M.A.
Carolyn Sirois-Zuch, M.A.

Assistant to the Coordinator of Introductory Writing Programs and Clinical Instructor of English

Lolly Ockerstrom, M.A.

Assistant to the Coordinator of Middler-Year Writing Requirement and Clinical Instructor of English

Janet Carr, M.A.

Director of the Writing Center and Clinical Instructor of English

Maureen Daly Goggin, M.A.

Coordinator of English Studies and Clinical Instructor of English

Jean S. Mullen-Smith, M.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The English Department curriculum is diverse in its aims and flexible in its design. For the general University community, the curriculum offers possibilities in creative, expository, and technical writing; linguistics; and American and foreign literature.

At a time when the price of imprecision in language is more than simple misunderstanding, and the cost of changing values more than personal uncertainty, the study of literature provides "a momentary stay against confusion." It deals with the hard edge of being, an insight into the ways of men and women, at

once clear and complex. In fact, the very structure of literature gives shape and meaning to the often formless experiences of life. And it does so with grace and force. Put another way, literature “tells it like it is,” not statistically, not abstractly, but with the details of fully realized people in accessible worlds, in “imaginary gardens with real toads in them.”

Professional Preparation

For the preprofessional student—in law, medicine, business, engineering, or computer science—the English Department offers a broad intellectual and cultural frame for specialist concerns. For the students who minor in English, it offers the possibility of concentration in literature, writing, linguistics, or technical communication to supplement the major concerns of other disciplines.

For the students who major in English, the curriculum offers the opportunity to prepare for careers in teaching and research, advertising and publishing, radio and television—indeed, any field in which communication and judgment go hand in hand.

The Major

The curriculum for the major in English allows the student to take a wide variety of courses while maintaining a strong background in the history of British and American literature. After completing the freshman requirement, the student who majors in English takes survey courses, area courses (in language or writing, British literature, American literature, major figure, genre), other electives, and, finally, a Junior-Senior Seminar as the culmination of study. A student has the opportunity to study science fiction, Kurt Vonnegut, topics in film, or children’s literature, as well as Shakespeare, early American literature, Romantic poetry, and topics in literary criticism. In an effort to be responsive to the individual interests and academic needs of a particular student, independent study also may be arranged with an English instructor.

There is flexibility enough in the curriculum requirements and its details to accommodate the pace and interest of a wide range of students. Members of the department are available throughout the year to help and advise students, but the critical choices rest essentially with the student. The American literature requirement, for example, may be met by successfully completing courses from among such recent offerings as Major American Novels, The New England Renaissance, American Realism, and American Romanticism. To this area, as to others, the department regularly adds new courses and, hence, even more options.

The Minor

Students who would like to minor in English may choose the minor in literature or in writing, either expository or creative. There are also interdisciplinary minors in linguistics and in technical

communication which are described in the Special Programs section of this publication. Within each minor, the student may select an individual course of study with the help of an English Department adviser.

Special Programs

See American Sign Language, Humanities Center, Independent Major, Irish Studies Minor, Linguistics Minor, Media Studies Minor, Romanticism Past and Present, Studies in American Fiction, Technical Communication Minor, and International Co-op in the Special Programs section, page 78.

Department of Journalism

LaRue W. Gilleland, M.A.J., *Professor and Chairman*

Associate Professors

Patricia Hastings, Ph.D.

William Kirtz, M.S.

Assistant Professors

Jane Bick, M.A.

Louis Conrad, M.S.

Charles Fountain, M.S.

Diane B. Willis, M.A.

William James Willis, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The Department of Journalism offers students the opportunity to prepare themselves for productive careers in print and broadcast news media, advertising, and public relations. It emphasizes professional skills in information gathering, writing, editing, photography, and design and graphics that may be applied to numerous fields.

Professional Preparation

Journalism offers many exciting, rewarding career opportunities. Northeastern University journalism graduates work for daily and weekly newspapers, news departments of radio and television stations, wire services, general and specialized magazines, public relations departments, and advertising agencies.

The department also seeks to contribute to the existing body of knowledge in journalism/mass communications, especially knowledge which will help news media practitioners and educators perform their jobs with increasing effectiveness. The department cooperates with media and related agencies in sponsoring professional workshops and seminars which students are invited to attend.

The Major

A journalist should have a broad background of liberal arts courses on the undergraduate level. At Northeastern, as in most major university journalism programs, the formula for the bachelor's degree in journalism is a combination of 75 percent arts and sciences courses and 25 percent professional courses. The ideal schedule is one or two journalism courses each quarter, with additional work in the humanities, social sciences, physical sciences, and economics.

Students may receive a bachelor of arts or bachelor of science degree. The B. A. requires completion of a foreign language requirement. Both require a College Core Curriculum.

Because journalism skills can be better expanded and understood with the aid of a laboratory, upperclass students who major in journalism are encouraged to participate in the Cooperative Plan of Education. Co-op assignments with newspapers, radio and television stations, news bureaus, advertising agencies, and public relations offices provide a practical laboratory experience important in helping students prepare themselves for careers in mass communications. Such experience also offers the student an advantage if he or she decides to seek admission to a graduate program.

Students who major in this department complete a journalism core program that includes News Editing, History of Journalism, Journalism Ethics, Newswriting, Editing, Law of the Press, and Photojournalism. In addition, each major takes courses in one of four concentrations—newspaper/print media, radio-television news, advertising, or public relations—according to his or her career objective.

The Minor

No minor is offered.

Special Programs

See Asian Studies Minor, American Sign Language, Independent Major, Media Studies Minor, Russian Studies Minor, The Center for the Study of Sport in Society, Technical Communication Minor, Urban Studies Minor, Women's Studies Minor, and International Co-op in the Special Programs section, page 78.

Department of Modern Languages

Holbrook C. Robinson, Ph.D., *Associate Professor and Chairman*
Robert B. Modee, M.A., *Assistant Professor and Executive Officer*

Professors

Samuel Jaramillo, Ph.D.
Constance H. Rose, Ph.D.

Associate Professors

Israel A. Aluf, Ph.D.
Lillian Bulwa, Ph.D.
Benedetto Fabrizi, D.M.L.
Walter M. Gershuny, Ph.D.
Juliette M. Gilman, Ph.D.
Bonnie S. McSorley, Ph.D.
Stephen A. Sadow, Ph.D.
Philip H. Stephan, Ph.D.

Assistant Professors

Ross D. Hall, Ph.D.
Inez Hedges, Ph.D.
Neil A. Larsen, Ph.D.
John Spiegel, M.A.

Instructor

Rita Soracco, M.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The study of modern languages can be of value to all students, regardless of their major fields of interest. In the complex and rapid pace of modern life, there is a need for increased communication between varied and often divergent cultures, even those within the narrow confines of one's own community. To better understand and appreciate these cultures, it is very important to know the ways in which the members of the culture think.

As the principal means of communication, language frequently offers the key to understanding. Thus, language may serve to help one achieve a more cosmopolitan, open-minded, and sensitive view of the world.

Professional Preparation

The department offers opportunities for background preparation to students interested in elementary, secondary school, or college teaching; international business relations; high-tech; government service; journalism; library science; world affairs; travel; and community service especially in Spanish-speaking areas. (Those who wish to teach in college must plan on graduate study.)

The Major

Available in French, German, Italian, Russian, or Spanish, the major in modern languages normally requires advanced courses in two languages. The freshman year usually is considered a year to establish the basic foundation upon which the major will be formed. It should be utilized to fulfill as many general requirements as possible so that during the upperclass years more time can be devoted to the major discipline. This year is also used to begin study of the first, principal, language.

Normally the study of a second language begins in the second year. However, in exceptional cases, this pattern may be altered to permit students to begin their second language in the freshman

year or, perhaps, postpone it to a later year. The student who majors in modern language should plan to take at least two language electives per quarter from the beginning of the second year. Again, of course, this pattern may be varied to fit the needs of the individual student.

It should be noted that the requirements indicated here for the first and second languages are *minimum* requirements. When at all possible, a student is strongly encouraged to go beyond them, and even, perhaps, to pursue a third language.

The department is currently designing a one-language major. Students are urged to consult their departmental advisers for further information concerning this program and other possible curriculum changes.

The department offers a choice of either a bachelor of arts or a bachelor of science degree. For either degree, the student must select a primary as well as a secondary language from French, German, Italian, Russian, or Spanish. Both degrees require Freshman English.

The B.A. is, of course, the traditional degree of this discipline. Candidates for the B.A. must satisfy the College requirements for graduation and, in addition, must meet the departmental requirements in their major. These requirements are sixteen quarter hours in history (any history courses relevant to the major are acceptable), eight quarter hours of Survey of English Literature, a minimum of thirty-two quarter hours of advanced work in the primary language, and eight quarter hours of advanced work in the secondary language. Advanced work may be defined as any course beyond the intermediate level of the language.

The bachelor of science degree in modern languages differs from the B.A. primarily in its emphasis. Whereas the B.A. requires that the student satisfy the full general requirements of the College of Arts and Sciences, the B.S. waives certain of these requirements in favor of a more concentrated program in the major area.

In addition, the candidate for the B.S. degree must complete eight quarter hours of composition and conversation in the first language and eight quarter hours of composition and conversation in the second language. Candidates then must complete forty additional quarter hours of advanced work in the primary language and sixteen additional quarter credits of advanced work in the secondary one.

The Minor

For students interested in acquiring proficiency in one foreign language as an adjunct to their major, the department offers a minor in modern languages, open to students of all colleges. The details of the requirements for a minor vary slightly from language to language, but, in all cases, the student is required to take a total of six courses. Generally, two composition and conversation

courses, a civilization course, and an introductory course in literature are required. The remaining courses are free electives drawn from advanced courses offered by the department.

Students are urged to consult the department adviser for further information about the minor.

Language Laboratories and Facilities

In the basic language courses, attendance in the language laboratory is required for two half-hour sessions per week. The facilities of the language laboratory are also available on an optional basis for advanced work. The department lounge is available to Modern Language students. See page 79 for information on courses in American Sign Language.

Special Programs

See Asian Studies Minor, American Sign Language, French for Business and Economics, Business German, Humanities Center, Independent Major, International Co-op, Irish Studies Minor, Russian Studies Minor, and Elementary Spanish for Criminal Justice and Human Services in the Special Programs section, page 78.

Department of Philosophy and Religion

Michael R. Lipton, Ph.D., *Associate Professor and Chairman*

Professors

Walter L. Fogg, Ph.D.

Pavel Kovaly, Ph.D., C.Sc.

Stephen L. Nathanson, Ph.D.

Associate Professors

William J. DeAngelis, Ph.D.

Bart K. Gruzalski, Ph.D.

Edward A. Hacker, Ph.D.

Gordon E. Pruett, Ph.D.

Susan M. Setta, Ph.D.

Joseph H. Wellbank, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Philosophy deals with a wide range of questions and issues generated by various aspects of human experience, by the beliefs and theories people hold, and by the practical problems human beings confront. Philosophy includes both questions and theories related to art, religion, morality, society, and natural and social sciences. Because of the breadth of its concerns, the study of philosophy provides a unique opportunity for students to examine their beliefs in many areas through critical reflection.

Through readings, discussion, and writing, philosophy students can encounter and examine questions concerning the nature and validity of religious beliefs, moral judgments, and scientific theories, as well as questions of values and social policy in such areas as law, medicine, and technology. In all these areas, analysis of issues and evaluation of arguments provide an opportunity to understand diverse claims to knowledge and areas of controversy.

Professional Preparation

The program includes courses that may help strengthen the student's work in other areas and provide an understanding of the methods and traditions of philosophical and religious thought. A major in philosophy may also help a student to acquire a broad background in the humanities and to sharpen his or her critical abilities in preparation for graduate or professional study. Indeed, former philosophy majors can be found in the most diverse of professional careers.

The Philosophy Major

Northeastern's program for a philosophy major is designed to offer students a balanced understanding of the nature of philosophy and particular philosophical problems that arise in the various arts and sciences. A maximum number of electives has been provided so that students may choose in accordance with their own backgrounds and interests. Students may pursue either a five-year cooperative or a four-year full-time course of study.

All degree candidates in philosophy must take at least eight quarter hours in English and fifty-two quarter hours in the department and must meet the following specific requirements:

1. Classical Greek Philosophy and Modern Philosophy
2. Introduction to Logic or Symbolic Logic (The department emphatically recommends that students contemplating graduate studies in philosophy take Symbolic Logic.)
3. Theory of Knowledge or Metaphysics or Moral Philosophy and
4. At least one seminar
5. Thirty-two quarter hours of philosophy electives, to be selected after consultation with the student's departmental adviser.

Religion Program

The program in religion offers students the opportunity to acquire an understanding of religious experience, both as an individual response and within its social, historical, literary, and political context. Specific religions (Christian, Jewish, Hindu, etc.) are studied as well as the mythical and mystical dimensions of religious experience in general. The program strives to clarify the relation between the religious experience and other facets of human life that are the concern of both the liberal arts and the professions. Although a major is not offered in religion, the program attempts to provide a basic introduction to religious studies. Both introductory and intermediate-level courses are offered.

The Minor

To attempt to meet the needs of students who are majoring in other areas but have a special interest in philosophy, the department offers a minor in philosophy. The program contains an essential core of courses, as well as a great range of electives to accommodate individual interests.

Specific requirements:

1. An introduction to philosophy course;
2. Either Classical Greek Philosophy or Modern Philosophy;
3. Either Introductory Logic or Symbolic Logic;
4. Either Moral Philosophy or Theory of Knowledge or Metaphysics or Philosophy of Mind;
5. Three electives in philosophy to bring the total number of quarter hours in philosophy to twenty-eight.

Special Programs

See Asian Studies Minor, Humanities Center, Independent Major, Women's Studies Minor, and International Co-op in the Special Programs section, page 78.

Department of Speech Communication

Carl W. Eastman, M.A., *Associate Professor and Chairman*

Associate Professors

Michael L. Woodnick, M.S.
Alan J. Zaremba, Ph.D.

Assistant Professors

Karen S. Buzzard, Ph.D.
Roberta L. Kosberg, Ph.D.

Lecturers

Edward G. Andelman, M.B.A.
Joseph Castiglione, M.S.
Wesley Horner, B.M.
Tom Larson, B.A.
William Rando, M.A.
Richard L. Shelburne, M.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The Department of Speech Communication seeks to help stimulate the personal and professional growth of the student through a study of the principles and methods of communication.

Courses are designed to aid students in understanding the communication process and the functions of communication in society. The speech communication program also helps students to increase their self-awareness and heighten personal development by offering theoretical and experiential learning opportunities.

Professional Preparation

The objectives of the speech communication major are threefold:

1. To stimulate the student's personal growth and development in perception and self-expression through the study of historical, contemporary, and artistic aspects of speech and communication, and to provide organized knowledge and critical insight;
2. To help prepare the student for professions that require both a theoretical and a technical knowledge of communication, such as broadcasting, the law, government service, public relations, advertising, social service, industrial communication, and similar fields;
3. To help prepare the student for advanced graduate study in communication and other professional fields.

The Major

Students may receive either a B.A. or B.S. degree in speech communication through concentrations related to mass communication, interpersonal communication, organizational communication, communication research, communication theory, advocacy, and public address. Through selection of the appropriate concentration within the department and complementary elective courses in other departments, students are afforded considerable flexibility in tailoring their programs to satisfy their personal and professional needs.

To further provide for the needs of students with individual interests or professional goals, the department offers directed-study and internship programs. Virtually every student who majors in speech communication completes one or more projects in each of these programs.

Directed Study

In directed study, the student works closely with a chosen faculty adviser while completing a student-selected research or performance project. Generally commensurate with the workload of a one-quarter course, directed-study projects deal with such areas as surveying and interpreting communicative behavior, studies of the rhetoric of political campaigns, or the effects of the media on society.

Internship Program

The internship program offers students the opportunity for professional development through field experiences designed to complement or implement their classroom training. Distinct from the Co-op Plan, the internship program provides academic credit for unpaid, part-time, on-site activities, during the student's academic quarters. Internships, carefully selected by the student and faculty advisers with an understanding based on the student's goals, often result in the student's placement in active roles in commercial broadcasting studios, advertising firms, and governmental agencies.

The Minor

Students majoring in such fields as political science, business, and human or social services or education may develop a minor in speech communication that complements their academic major by selecting appropriate courses with the aid of a speech communication faculty adviser.

Basic theoretical competence and personal skills in the areas of interpersonal, group, organizational, and public communication may be acquired by taking the following four core courses required of all minors: Introduction to Communication Theory, Business and Professional Speaking, Interpersonal Communication I, and Group Discussion.

Individual needs and specific goals may be satisfied by selecting three additional electives with the approval of the speech communication faculty. Recommended elective groupings have been developed for students concentrating in management, marketing, elementary or secondary education, human or social services, political science, sociology, psychology, and journalism.

Special Programs

See American Sign Language, Asian Studies Minor, Humanities Center, Technical Communication Minor, Independent Major, and International Co-op in the Special Programs section, page 78.

Natural Sciences and Mathematics Division

The natural sciences are disciplines based chiefly on objective, quantitative hypotheses that can be confirmed or refuted by experimentation involving numerical measurements. These disciplines are sometimes referred to as the “exact sciences.” However, that may be somewhat misleading, since controlled approximations are more characteristic of them than exactness.

The term used for the natural sciences in the seventeenth and eighteenth centuries was “natural philosophy.” This embraced the physical and life sciences as well as mathematics. The great treatise of Isaac Newton, which altered completely the understanding of the physical universe, was titled *Philosophiae naturalis principia mathematica* (Latin for *Mathematical Principles of Natural Philosophy*).

Although mathematics is not confined to the study of nature as such—having more basic roots in subjective thought than in objective reality—it is nearly always grouped with the natural sciences. Indeed, mathematics is sometimes referred to as the “queen and servant of the sciences.”

In the College of Arts and Sciences, the major disciplines comprising the Natural Sciences and Mathematics Division are as follows:

- Biology page 41
- Chemistry page 44
- Geology page 46
- Mathematics page 49
- Physics page 51

Department of Biology

David C. Wharton, Ph.D., *Professor and Chairman*

Professors

Francis D. Crisley, Ph.D.
Janis Z. Gabliks, Ph.D.
Charles A. M. Meszoely, Ph.D.
M. Patricia Morse, Ph.D.
Fred A. Rosenberg, Ph.D.
Ernest Ruber, Ph.D.
Kenneth P. Sebens, Ph.D.
Phyllis R. Strauss, Ph.D.

Associate Professors

Joseph L. Ayers, Ph.D.
Kostia Bergman, Ph.D.
Donald P. Cheney, Ph.D.
Charles H. Ellis, Jr., Ph.D.
Gwilym S. Jones, Ph.D.
Helen H. Lambert, Ph.D.
Joseph V. Pearincott, Ph.D.
Daniel C. Scheirer, Ph.D.
Henry O. Werntz, Ph.D.

Assistant Professors

John W. Bodnar, Ph.D.
Richard L. Marsh, Ph.D.
Jacqueline M. Piret, Ph.D.
Susan Powers-Lee, Ph.D.
Cristina Reyero, Ph.D.
Wendy A. Smith, Ph.D.
Jon D. Witman, Ph.D.

Emeritus Professors

Charles Gainor, Ph.D.
Nathan W. Riser, Ph.D.

Adjunct Professor

Bruce B. Collette, Ph.D.

Adjunct Assistant Professor

Barbara L. Thorne, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The biology major offers students the opportunity to develop a basic understanding of the organization and the processes of life, from the level of molecules and cells through the level of organs and organ systems to the level of populations, species, ecosystems, and evolution. The major also offers the mathematical, chemical, and physical background necessary to understand biology and to help train students in practical scientific skills associated with each of these areas of study. Finally, it allows students to begin to specialize in a subdiscipline of biology.

Professional Preparation

The biology major provides an opportunity for excellent preparation for a wide variety of careers or professions in the life sciences, including medical, dental, and other health-related professions. Graduate study leading to a master's or doctoral degree can open careers in upper-level teaching and/or research in one of the specialized areas of biology, such as zoology, botany, microbiology, physiology, ecology, marine biology, cell biology, or biochemistry. Biology majors may also pursue postgraduate training in such health-related areas as nutrition, public health, or medical technology.

Students who major in biology but who do not wish to enter professional or graduate schools may find employment on technical levels in federal, state, industrial, hospital, or university laboratories doing research, survey, or quality control in a biological area. They may also be able to enter directly into positions in

industries involved in the manufacture and distribution of pharmaceuticals, biological products, food, or scientific equipment. Many biologists are employed at all levels in fisheries, forestry services, county and state agencies, museums, aquariums, research vessels, and marine stations.

Preprofessional students (for example, premedical or predental) are urged to consult with the preprofessional advisory committee early in their careers at Northeastern. *Students are cautioned that the successful completion of the required preprofessional courses by no means ensures admission to a professional school since other factors are also involved.*

The Major

The major consists of ten biology courses in addition to those required in chemistry, physics, and mathematics. Six of the biology courses constitute the required "Biocore": Principles of Biology I, II, and III; Environmental and Population Biology; Genetics and Developmental Biology; and Cell Physiology and Biochemistry. The other four biology courses for the major may be chosen from a variety of upperclass biology electives which require some or all of the Biocore as prerequisites. It is usually possible to follow the prescribed sequence if a student has decided on the major in the freshman or sophomore year. For students who may enter the major in the middle year, it is often possible to complete the major in the normal time by taking some of the electives concurrently with the latter, Biocore courses.

To graduate with a major in biology, a student must have a cumulative Quality Point Average (QPA) of 2.0 for all science and mathematics courses required for the major. There are two programs within the biology major, one leading to the bachelor of arts degree and the other to the bachelor of science degree. Both the B.A. and the B.S. degrees require a modern language. The B.S. program is more rigorous and extensive in its mathematics and science requirements and thus may offer better preparation for some areas of postgraduate study. The difference is mainly one of emphasis, however.

After completing the Biocore, students interested in independent research may arrange with individual faculty to undertake directed study; if eligible, they may be invited to undertake a more extensive honors program involving up to four quarters of research.

The department publishes a booklet, *The Biology Undergraduate Advisory Book*, which explains the required and recommended courses and the QPA standards in science for biology majors. The *Advisory Book* is available in the Biology Office, Room 414, Mugar Hall. Students intending to major in biology should obtain a copy as early as possible after their enrollment at Northeastern. Biology majors wishing to pursue a minor in another field should see their biology adviser as early in their program as possible.

The Minor

A minor in biology consists of any six biology courses for which the student has the prerequisites, plus two more courses which may be biology courses or courses from other departments that serve as prerequisites for biology courses. At least five of the total eight courses must include laboratory, and a student may not count toward the biology minor more than one course, or course sequence, that covers substantially the same material.

To accommodate the needs of students majoring in many different fields, the biology minor requirements have been phrased in a very general and flexible way. To ensure that course selection is sound and appropriate to the student's background, *each student's biology minor program must receive the signed approval of the biology minors' adviser*. The student should obtain this required approval of his/her program before the start or, at the latest, by the end of the first biology course. Failure to do so may result in courses not being counted for a minor, if the adviser finds them to have been inappropriate selections.

The academic standards for a minor in biology are the same as those for a biology major; namely, a QPA of 2.0 must be achieved for those courses used to satisfy the minor requirements. Courses taken on a pass/fail basis are not acceptable for minor credit.

Suggested course groupings for a biology minor have been developed for students with different backgrounds in college mathematics and science. The core minor for students with considerable course work in mathematics, chemistry, or physics provides the basic foundation on which a biology major is built, without advanced specialization. For students with less college mathematics/science background—or none—three other minor options provide the opportunity for first-level exposure to the basic principles of biology. In addition, this gives them an opportunity to achieve some advanced specialization in plant and/or animal studies or to explore human biology, molecular biology, biochemistry, and the problems of the environment. For further information, consult with the biology minors' adviser.

Laboratories

The Biology Department has specially equipped teaching laboratories for general biology, botany, anatomy, microbiology, microscopy, physiology, zoology, and cell biology, molecular biology, and biochemistry. Equipment for field work, museum specimens, models, and charts are employed in laboratory instruction. Additional facilities include aquarium and animal rooms, stockrooms, preparation rooms, research areas, a vertebrate museum, and a large suburban greenhouse and woodlot. The department has close association with the University's Marine Science and Maritime Studies Center in Nahant and with the University's Electron Microscopy Center.

Special Programs

See School for Field Studies, Independent Major, Instrumentation for Science Minor (see Physics Section), International Co-op, Marine Studies Minor, Combined Program with Preprofessional Schools and East/West Marine Biology Program in the Special Programs section, page 78.

Department of Chemistry

Philip W. Le Quesne, Ph.D., D.Sci., *Professor and Chairman*

Professors

Geoffrey Davies, Ph.D.
Bill C. Giessen, Dr.Sc.Nat.
Arthur M. Halpern, Ph.D.
Barry L. Karger, Ph.D.
William M. Reiff, Ph.D.
John L. Roebber, Ph.D.
Robert A. Shepard, Ph.D.
Alfred Viola, Ph.D.
Paul Vouros, Ph.D.

Professors Jointly Appointed

John L. Neumeyer, Ph.D.
Robert F. Raffauf, Ph.D.

Associate Professors

David A. Forsyth, Ph.D.
Thomas R. Gilbert, Ph.D.
David M. Howell, Ph.D.
Conrad M. Jankowski, Ph.D.
Elmer E. Jones, Ph.D.
Mary J. Ondrechen, Ph.D.
Kay D. Onan, Ph.D.
Robert N. Wiener, Ph.D.

Assistant Professors

Michael E. Kellman, Ph.D.
John Wronka, Ph.D.

Instructors

James F. Hall, Jr., M.S.
Bernard J. Lemire, B.S.,
Supervisor of Laboratories

Degrees Offered: Bachelor of Arts, Bachelor of Science

Chemistry is concerned with the structure and properties of substances and with the transformations they undergo, and modern chemistry is the cornerstone for a large number of professions and industries. The educational objectives of the Chemistry Department are to give students the opportunity to (1) experience the intellectual stimulation of studying a physical science; (2) grasp the basic principles and techniques that are central to a variety of chemistry-related careers; and (3) prepare for graduate study in chemistry or related fields.

Professional Preparation

Challenging career opportunities exist in almost all technical fields in which such functions as research, development, production, sales, market analysis, quality control, and management are involved. The chemistry major programs at Northeastern are based on a career-oriented concept and offer the students an excellent opportunity to prepare for the study of medicine and dentistry and to do advanced study in many fields of science.

The basic core of courses in chemistry, mathematics, and physics may be supplemented with selected courses in other areas.

Alumni have pursued careers in many areas, such as:

- The health professions (medicine, dentistry)
- Professional and technical employment in industry
- Chemical sales and management
- Teaching and research (via graduate study)
- Clinical chemistry, medicinal chemistry, and pharmaceutical chemistry
- Geochemistry, mineralogy, and environmental chemistry
- Forensic chemistry

The Major

The Chemistry Department offers two major programs that lead to the B.A. or B.S. degree. The department is relatively small, having a combined total of about sixty students throughout all levels. All the courses are taught by full-time chemistry faculty members, and, since classes are small, there is considerable opportunity for direct interaction between faculty and students. The two degree curricula differ mainly in their arts and sciences content and advanced science course requirements.

The department publishes an informational booklet, *Chemistry at Northeastern*, which describes the chemistry major curriculum and requirements in detail. Interested students may obtain a copy of this booklet in the main office of the Chemistry Department, Room 102, Hurtig Hall or from the Department of Admissions, 150 Richards Hall.

A large part of the curriculum is common to all options. It consists of courses in English, calculus, physics, and basic chemistry, which are taken in the freshman year. Students may be exempted from the general chemistry courses by passing equivalency tests. In this case other courses are substituted. In the upperclass years, students take courses in organic, inorganic, physical, and analytical chemistry. For the B.S. degree, some additional advanced mathematics and science courses are required. German or Russian is strongly recommended for students who plan to pursue graduate study in the sciences.

Qualified students are encouraged to undertake a research program under the supervision of a faculty member. An honors program is open to especially able students.

The Minor

A minor program in chemistry is available for students majoring in other fields. It consists of courses in general, analytical, organic, and physical chemistry. Further information may be obtained from the Chemistry Department Office, Room 102, Hurtig Hall.

Accreditation

The chemistry programs at Northeastern are approved by the American Chemical Society. The B.S. degree meets the society's requirements for certification, which means that a certified graduate is eligible for full membership in the A.C.S. after two years of experience.

Facilities and Research

The main facilities of the Chemistry Department are housed in Hurtig Hall, a modern, air-conditioned, five-story building that contains equipment for up-to-date teaching and research. Faculty offices are located there, as is the James Flack Norris Room, which serves as a lounge for undergraduate chemistry majors. Additional research facilities are located in the Forsyth Building and in the Institute of Chemical Analysis, Applications, and Forensic Science. The department's major research equipment includes electron microscopes, mass spectrometers, lasers, X-ray diffractometers, nuclear magnetic-resonance and electron spin-resonance spectrometers, Gouy and Faraday magnetic balances, Mossbauer spectrometers, and a variety of ultraviolet and infrared spectrometers. Undergraduate students taking advanced courses or working on research projects may utilize certain of these instruments.

Special Programs

See Combined Program with Pre professional Schools, School of Field Studies, Independent Major, International Co-op, Instrumentation for Science Minor (see Physics Section), Marine Studies Minor, and East/West Marine Biology Program in the Special Programs section, page 78.

Department of Geology

Richard H. Bailey, Ph.D., *Associate Professor and Chairman*

Professors

Richard S. Naylor, Ph.D.

William A. Newman, Ph. D.

Assistant Professor

Malcolm D. Hill, Ph.D.

Associate Professors

Bernard L. Gordon, M.S.

Peter S. Rosen, Ph.D.

Martin E. Ross, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The Department of Geology offers a degree program in geology as an in-depth study of a major area of the earth sciences, as well as courses in geology, oceanography, and astronomy, which are available to all students.

Geology is a broad-based science that deals with the study of the physical features, composition, history, and processes of the

earth. The study of geology, however, also demands an understanding of the application of scientific knowledge to current problems and concerns. For example, the manufacture of an enormous number of products composed of metals and petroleum derivatives is a primary basis of the economy of our society. Understanding the origins of these natural resources and the ways in which to ensure their continued supply is, therefore, one of the major roles of today's geologists. Only a small portion of the earth has been studied in detail, leaving many unexplored frontiers for each new graduate in the field.

Professional Preparation

Northeastern University's geology program is designed to provide the basic knowledge required to work in almost any of the geological professions, in both industry and government. Graduates are currently working for geotechnical, consulting, or engineering firms, studying environmental problems such as groundwater contamination, or analyzing sites proposed for new construction. A large number of geology graduates work in the oil industry and for government agencies.

The Major

Since the study of geology utilizes principles of other physical sciences, students should complete basic courses in chemistry, physics, and mathematics along with physical and historical geology during their first two years. After completing the introductory geology courses and one year of chemistry, every geology major takes a three-course sequence—Descriptive Mineralogy, Optical Crystallography, and Optical Mineralogy—since a knowledge of minerals is fundamental to geological understanding. In addition to the required introductory and mineralogy courses, the student chooses a minimum of six (for the B.A. degree) or eight (for the B.S. degree) additional geology courses. There are also electives required in the areas of the humanities and social sciences.

Each student is assigned an adviser in the department. The adviser assists students in making appropriate course selections as their knowledge increases and special interests develop. Though not required, courses in petrology, structural geology, and paleontology are usually among the electives chosen by undergraduates.

During the junior and senior years, students may select undergraduate research as one of their elective courses. Under the supervision of a faculty member, a problem is selected, defined, and researched. These projects offer undergraduates the opportunity to go much more deeply into some aspect of geology that holds particular interest for them. Students who meet the college requirements for the honors program may also be invited to carry out an undergraduate research project.

The Minor

The Department of Geology offers a minor in geology.

Field Trips

Although much geology can be learned from textbooks and in the laboratory, a sound geological education must also include first-hand experience in the field and direct observation of geological phenomena. Whenever it is appropriate, field work on an individual or group basis will be part of courses.

Special Programs

See School for Field Studies, Independent Major, International Co-op, Instrumentation for Science Minor (see Physics Section), Marine Studies Minor, and East/West Marine Biology Program in the Special Programs section, page 78.

Department of Mathematics

Maurice E. Gilmore, Ph.D., *Professor and Chairman*

Professors

Samuel J. Blank, Ph.D.
Gail Carpenter, Ph.D.
Bohumil Cenk, Sc.D.
Ron Donagi, Ph.D.
David I. Epstein, Ph.D.
Holland C. Filgo, Ph.D.
Alberto R. Galmarino, Ph.D.
R. Mark Goresky, Ph.D.
Arshag B. Hajian, Ph.D.
Evelyn F. Keller, Ph.D.
Nancy Kopell, Ph.D.
Richard Porter, Ph.D.
Jayant Shah, Ph.D.
Gabriel Stolzenberg, Ph.D.
Chuu-Lian Terng, Ph.D.
Jack Warga, Ph.D.

Associate Professors

Shirley A. Blackett, M.Ed.
Mark Bridger, Ph.D.
Robert W. Case, Ph.D.
Bruce Claflin, M.S.
Margaret B. Cozzens, Ph.D.
John Frampton, Ph.D.
Terence Gaffney, Ph.D.
Eugene Gover, Ph.D.
Samuel Gutmann, Ph.D.
Anthony Iarrobino, Ph.D.
Solomon M. Jekel, Ph.D.
Nishan Krikorian, Ph.D.
Marc Levine, Ph.D.
Robert C. McOwen, Ph.D.
Mark Ramras, Ph.D.
Thomas O. Sherman, Ph.D.
Gordana G. Todorov, Ph.D.

Assistant Professors

Margaret Bayer, Ph.D.
David Bernstein, Ph.D.
Zhou Bing, Ph.D.
Mo-suk Chow, Ph.D.
Stanley J. Eigen, Ph.D.
Leonore Feigenbaum, Ph.D.
Laurence S. Gillick, Ph.D.
Donald R. King, Ph.D.
N.V.R. Mahadev, Ph.D.
Zakhar G. Maymin, Ph.D.
Carla B. Oblas, M.S.
M. Inez Platzeck, Ph.D.
Prabhakar A. Rao, Ph.D.
Martin Schwarz, Ph.D.
Nevin P. Scrimshaw, Ph.D.
Joel A. Stein, Ph.D.
Alexandru Suciu, Ph.D.
Barbara Tabak, Ph.D.
Jerzy Weyman, Ph.D.
Shu-Shi Wu, Ph.D.
Qiqing Yu, Ph.D.

Postdoctoral Research Associate

Jeremy M. Orloff, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The Department of Mathematics offers interested students the opportunity to develop and expand their abilities in this exact science, one of the oldest and most basic of all the sciences. Mathematics has become the foundation and a rich source of methods for most science and technology. Mathematicians possess the skill to analyze the crucial features of many diverse problems and apply rigorous techniques to solve them.

Professional Preparation

Mathematical training may lead to opportunities in a large variety of fields of applied research (natural sciences, engineering, economics, management, computer science, to name a few) besides the more traditional options of mathematical research, teaching and/or jobs in industry. Because of so many available directions, mathematics students have great flexibility to plan their studies according to specific goals.

The Major

The department offers two programs of study in mathematics. One leads to a bachelor of arts degree and requires a minimum of thirteen mathematics courses. Students in the bachelor of arts program also must complete a foreign language requirement. Because mathematics-related material is more often written in French, German, Italian, or Russian, one of these languages is recommended. The other program leads to a bachelor of science degree. It requires a minimum of sixteen mathematics courses but does not require the study of a foreign language.

All students must take a basic sequence of mathematics courses, which, as a rule, should be completed by the end of the sophomore year. The sequence offers students the opportunity to acquire a working knowledge of the calculus of one and several variables, differential equations, some linear algebra, and numerical methods. With respect to the latter, although a computer programming course is not required, students will be encouraged and eventually expected to learn the basic programming skills necessary for numerical solutions of complex problems.

A transition from the basic sequence to more advanced parts of the curriculum is provided by Analysis I-II and Advanced Linear Algebra I. These courses are prerequisites for many advanced courses in applied analysis, complex analysis, topology, and foundations.

As a rule, students planning to take a substantial number of mathematics courses (e.g., two per quarter) should take Analysis I-II and Advanced Linear Algebra I in the middler year. Students may wish to take a prerequisite for more advanced courses in algebra and/or one that includes linear, nonlinear, and dynamic programming. Courses in probability, statistics, and numerical analysis may also be taken directly after the basic sequence.

Double Majors

It is possible for mathematics majors to follow programs leading to a double major in mathematics and another discipline from the College of Arts and Sciences or the College of Computer Science.

The Minor

No minor is offered.

Teaching Certification

A student who majors in mathematics can receive Massachusetts certification to teach in high school at the same time that he or she receives the bachelor's degree in mathematics. All that is necessary is: (1) to complete the requirements for a major in mathematics; (2) to take six specific courses in education; (3) to do one quarter of practice teaching.

Special Programs

See Independent Major, International Co-op, Instrumentation for Science Minor (see Physics section).

Department of Physics

Robert P. Lowndes, Ph.D., *Professor and Chairman*

Professors

Ronald Aaron, Ph.D.
Petros N. Argyres, Ph.D.
Richard L. Arnowitt, Ph.D.
Alan H. Cromer, Ph.D.
William L. Faissler, Ph.D.
Marvin H. Friedman, Ph.D.
David A. Garelick, Ph.D.
Marvin W. Gettner, Ph.D.
Michael J. Glaubman, Ph.D.
Hyman Goldberg, Ph.D.
Walter Hauser, Ph.D.
Giovanni Lanza, Ph.D.
Bertram J. Malenka, Ph.D.
Pran Nath, Ph.D.
Clive H. Perry, Ph.D.
Eugene J. Saletan, Ph.D.
Carl A. Shiffman, Ph.D.
Jeffrey B. Sokoloff, Ph.D.
Yogendra N. Srivastava, Ph.D.
Michael T. Vaughn, Ph.D.
Eberhard von Goeler, Ph.D.
Allan Widom, Ph.D.
Fa Yueh Wu, Ph.D.

Associate Professors

Arun Bansil, Ph.D.
Paul M. Champion, Ph.D.
Jorge V. Jose, Ph.D.
Marie E. Machacek, Ph.D.
Robert S. Markiewicz, Ph.D.
Stephen Reucroft, Ph.D.

Assistant Professors

George O. Alverson, Ph.D.
Narendra Jaggi, Ph.D.
Jacqueline Krim, Ph.D.
Mark Novotny, Ph.D.
Robert Polvado, Ph.D.
Lou Reinisch, Ph.D.
Srinvas Sridhar, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Physics is concerned with the fundamental principles that govern natural phenomena, ranging in scale from collisions of subatomic particles, through the behavior of solids and liquids, to exploding stars and colliding galaxies.

Understanding these principles can help us unravel, explore, and predict the basic phenomena and processes not only of physics, but also of biology, chemistry, and the earth and space sciences. Such an understanding will also help with the creation, development, and operation of a broad spectrum of micro and macro devices ranging from the silicon chip electronic systems and lasers of today's high technology to the more conventional mechanical and electrical instruments and machinery currently used in research and industrial organizations.

Professional Preparation

Students who major in physics are offered the opportunity to prepare for a wide variety of careers. In addition to work in industrial, government, and high-technology laboratories in areas of applied physics, students who have mastered the fundamental principles emphasized in a physics education may find opportunities in allied fields, such as biophysics, computer sciences, geophysics, medical and radiation physics, and various branches of engineering. Additionally, many students majoring in physics go on to pursue advanced degrees in physics and related fields.

The educational objectives of the physics undergraduate programs are to provide students with the opportunity to:

1. experience the intellectual stimulation of studying science; specifically, physics and astrophysics;
2. experience, by association, the excitement of the front-line research programs ongoing in the department;
3. achieve an understanding of the basic principles and techniques that are central to the broad array of physics-related careers;
4. prepare for graduate study in physics or related fields.

To this end the Physics Department offers undergraduate courses at four levels:

1. descriptive courses intended primarily for nonscience majors with limited mathematical backgrounds;
2. general survey courses intended for students in scientific and engineering fields;
3. advanced courses focusing on particular areas of physics and intended mainly, but not exclusively, for physics majors; and
4. highly advanced courses intended mainly, but not exclusively, for prospective graduate students in physics.

A student majoring in physics may follow either a four-year full-time program or a five-year co-op program. The Co-op program allows students to alternate between the classroom and off-campus work experiences in research and professional organizations located not only in the important high-technology centers in and around Boston, but elsewhere in the United States. In a number of cases, students in the physics major work on co-op with a high-technology company, and then return to school and work with a related aspect in one of the research programs of the Department either for credit or as work-study.

The Major

Students majoring in physics may obtain one of three degrees: the bachelor of arts in physics, the bachelor of science in physics, or the bachelor of science in applied physics. They may follow either a four-year full-time program or a five-year co-op program.

The first-year program for all physics majors includes a three-quarter physics sequence common to all science and mathematics majors, and a three-quarter calculus sequence. The remaining courses in each quarter of the freshman year can be chosen from a wide range of electives, but generally students are advised to meet some of the core curriculum requirements and perhaps to learn to use the computer.

Beyond the basic first year survey courses in physics and mathematics, B.A. students are required to pass the two second-year intermediate physics courses, three upper-division lecture courses, three upper-division laboratory courses, as well as one upper-division mathematics elective. In addition, the College requirements must also be satisfied. This program is extremely flexible and allows the B.A. physics major to pursue other interests in depth.

Candidates for either of the B.S. physics degrees must complete the two intermediate physics courses, the second year of the calculus sequence, and a year of differential equations. In addition, the B.S. candidates must satisfy the appropriate college requirements.

Candidates for the B.S. in physics must also complete seven upper-division physics lecture courses, three upper-division physics laboratory courses, and five additional technical electives (courses from the sciences, mathematics, or engineering departments). The B.S. in physics program is most appropriate for those students who wish to pursue graduate study in physics.

In addition to the common intermediate level courses described above, candidates for the B.S. in applied physics degree must complete three upper-division physics lecture courses, five upper-division physics laboratory courses, three computer science courses, and four additional technical electives. The B.S. in applied physics program is most appropriate for those students who expect to proceed directly to work after the B.S. degree, or for those who expect to go to graduate school in related fields.

The upper-division lecture courses offered by the department include Mechanics, Wave Motion and Optics, Thermodynamics, Electromagnetic Theory, Quantum Mechanics, Mathematical Physics, Nuclear Physics, Solid State Physics, Plasma Physics, and Astrophysics. The upper-division laboratories include Wave Motion, two quarters of Electronics, a laboratory devoted to micro-computer programming and interfacing, and a special project laboratory in which the student designs and carries out a complete project involving either some aspect of instrumentation or some aspect of computational physics.

The Minors

The Physics Department offers two minor programs for students majoring in other fields: the physics minor and the instrumentation for science minor.

The physics minor program is designed to accommodate a wide variety of interests while still providing a study of the fundamentals. To fulfill the requirements of this minor, a student must take five intermediate and/or advanced courses after completing introductory physics.

The instrumentation for science minor is designed to provide a student with experience in the use of common laboratory instruments, the taking and the analysis of data, and elementary skills in electronics. A major goal of the minor is to prepare the student to design and construct relatively small scale special purpose measurement instrumentation. To fulfill the requirements of the minor a student must take four intermediate and/or advanced laboratory courses after completing introductory physics.

Further information on the minor programs may be obtained from the Physics Department Office, Room 112, Dana Research Center.

Honors Program and Undergraduate Research

Undergraduate students invited into the Honors Program may take graduate courses, reading courses, and special topics courses, by petition, in the various research fields of the department. Such work occasionally leads to presentation of papers at professional meetings and to publication in professional journals.

Facilities

The Physics Department is housed in the Dana Research Center, a modern, air-conditioned building which includes its own library, research laboratories, department and student machine shops, electronics shop, conference and seminar rooms, and faculty and graduate and undergraduate student offices. The department has its own computer facility, housing a VAX II/750 computer, as well as PDP 11/24 and LSI 11/23 computers dedicated to physics research programs. In addition, a departmental terminal cluster providing access to three VAX 11/780 units of the University Computer Center is located in the Dana Center.

In addition to the research facilities on campus, faculty and graduate students currently pursue their research at a variety of off-campus national and international facilities: astrophysics experiments at the NASA Infrared Telescope Facility, Mauna Kea, Hawaii, at Kitt Peak National Observatory, Tucson, Arizona, and at NRAO Very Large Array, Socorro, New Mexico; high-energy physics experiments at the Stanford Linear Accelerator Center (SLAC), Palo Alto, California, at CERN, Geneva, Switzerland, and at the Fermi National Accelerator Laboratory (Fermilab), Batavia, Illinois; high-magnetic field experiments at the National

Magnet Laboratory, Cambridge, Massachusetts; inelastic neutron scattering experiments at the Brookhaven National Laboratory, New York, at the Oak Ridge National Laboratory, Oak Ridge, Tennessee and at the Laue-Langevin Institute, Grenoble, France.

The department's full-time faculty are involved in a broad spectrum of front-line experimental and theoretical programs in astrophysics, atomic and molecular physics, biophysics, elementary particle physics, and solid state and low temperature physics. A full description of these programs may be obtained upon request to the chairman of the department.

Special Programs

See Independent Major and International Co-op, Marine Studies Minor in the Special Programs section, page 78.

Social Sciences Division

The social sciences are disciplines involving the study of society as such, as well as the social behavior of individuals and groups. In contrast to the approach used in the humanities, the social sciences tend to focus on objective aspects of societies. Measurement and testing and the statistical treatment of data play a large role in the social sciences.

On the other hand, this distinction is helpful only if used with caution. In the final analysis, human beings and human institutions cannot be studied without due attention to both subjective *and* objective factors. For this reason, the dividing line between humanities and social sciences cannot be drawn sharply.

In the College of Arts and Sciences, the major disciplines comprising the Social Sciences Division are as follows:

African-American Studies page 56

Economics page 58

History page 60

Human Services* page 62

Linguistics page 64

Political Science page 67

Psychology page 69

Sociology/Anthropology page 72

Department of African-American Studies

Associate Professor

Holly M. Carter, Ph.D.

Assistant Professors

Ernest D. Brown, Ph.D.

Jordan Gebre-Medhin, Ph.D.

Patrick Manning, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

African-American studies at Northeastern University offers an interdisciplinary study of the black experience with two central purposes: (1) to provide academically rigorous and exciting courses for all students interested in the field; and (2) to contribute to the students' ability to develop analytical skills and to apply this learning, whatever their disciplines or career objectives.

By presenting fresh perspectives while remaining firmly grounded in traditional academic standards, the courses in African-American studies may aid the student to develop the skill of

* The human services major is offered jointly by the College of Arts and Sciences and the Boston-Bouvé College of Human Development Professions.

critical thinking, provide the opportunity to gain a meaningful, liberal arts education, and help to form a strong basis for professional or graduate work.

Students from other disciplines should find that the courses in African-American studies are designed to complement and enrich their chosen concentrations or majors.

Professional Preparation

A major in African-American studies offers students the opportunity to prepare themselves for a wide range of professions calling for an understanding of intergroup relations and the minority experience. Students may go on to graduate study in such areas as social work, sociology, education, law, business, history, or the humanities.

The Major

Students majoring in African-American studies may earn either the bachelor of arts or bachelor of science degree. Both degrees require the following courses:

- Economic Issues in Minority Communities
- Directed Study for Senior Thesis
- Africa Today
- African-American Literature I
- Contemporary Issues in Black Society
- Black Psychological Identity
- African-American History I
- Research Seminar
- Survey of Black Political Movements
- Race Relations in America

Faculty advisers work with students to help them select electives within their chosen areas of concentration to fulfill their distribution and language requirements for the degree of bachelor of arts, or career package programs for the degree of bachelor of science.

The Minor

A minor in African-American studies is designed to meet the needs of students who major in other areas but have a special interest in African-American studies. To qualify for a minor in African-American studies, a student must earn twenty-eight quarter hours in the field, twelve of which are from the set of major courses listed above. The remaining courses will be a concentration cluster that is arranged in consultation with the student's faculty adviser. A concentration cluster is comprised of a set of four

courses which focus on a given aspect of African-American studies. A cluster might focus on sociology-psychology, history, humanities, human services, research, or other areas related to the student's educational or career needs. Concentration clusters are arranged in consultation between the student and a faculty adviser.

Special Programs

See Asian Studies Minor, Independent Major, International Co-op, Urban Studies Minor, and Women's Studies Minor in the Special Programs section, page 78.

Department of Economics

Morris A. Horowitz, Ph.D., *Professor and Chairman*

Professors

Conrad P. Caligaris, Ph.D.
Harold M. Goldstein, Ph.D.
Daryl A. Hellman, Ph.D.
Irwin L. Herrnstadt, Ph.D.
Sungwoo Kim, Ph.D.
Gustav Schachter, Ph.D.

Associate Professors

Neil O. Alper, Ph.D.
Bruce Bolnick, Ph.D.
Oscar Brookins, Ph.D.
Steven A. Morrison, Ph.D.
Pawan K. Sawhney, Ph.D.
Andrew M. Sum, M.A.
Gregory Wassall, Ph.D.

Assistant Professors

Anthony Becker, M.A.
Kamran N. Dadkhah, Ph.D.
Alan Dyer, Ph.D.
Barbara M. Fraumeni, Ph.D.
Jeanne K. Henn, Ph.D.
Teh M. Huo, Ph.D.
Gary B. Stone, M.A.

Lecturers

Anthony Carilli, M.A.
Sergeio A. Centeio, M.A.
Maria N. DaCosta, M.A.
Paul Harrington, M.A.
Md. Mahabub Islam, M.A.
Kamalesh Misra, M.A.
Neeta Parekh, M.A.
Syed Rizavi, M.A.
Manijeh Sabi, M.A.
Nazma Latif-Zaman, M.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Economics is the study of ways in which scarce resources, including human resources, are deployed to satisfy the material wants of individuals and society. Economists analyze the factors that determine the success or failure of this process.

Professional Preparation

The economics program offers students the opportunity to obtain a better understanding of how our economy and other economies function, to prepare themselves for graduate study in economics, and to develop specialties that may qualify them to work as economists.

Macroeconomics, concerned with the overall economy, deals with such problems as inflation, unemployment, growth and instability, and government monetary, fiscal, and regulatory policies. Microeconomics is concerned with the economic behavior of individuals, households, firms, and industries. It assesses the economic effects of racism, sexism, pollution, and environmental damage and analyzes the economic aspects of natural resources, poverty, health, income distribution, trade unions, and collective bargaining.

Graduates may be employed by businesses in such activities as industrial relations, planning and forecasting, determining plant locations, and making financial studies. They may become expert in analyzing consumer demand and developing and marketing new products. They may conduct research, teach, or provide specialized consulting services. In addition, federal, state, local governments, and trade unions are important sources of jobs for economists.

A baccalaureate economics degree, or graduation with a number of advanced economics courses, offers students an excellent opportunity to prepare themselves for graduate programs in economics as well as for entry into schools of law and business.

The Major

There is considerable flexibility in the economics program to enable students to concentrate in areas of personal interest. A student expecting to major in the field should take the problem-oriented Principles of Economics in the freshman or sophomore year to discover the range of insights economics can offer in analyzing and solving a variety of problems. Upper-division courses apply theory to an in-depth study of a specific area of the field.

Other courses for the major include two quarters each of fundamentals of mathematics, economic statistics, and economic theory. In addition, the department offers electives in all areas of economics, honors courses, reading courses, and a senior seminar.

The courses listed above are required for either the bachelor of arts or bachelor of science degree. However, the B.A. follows the liberal arts tradition in its distribution and language requirements—the Department of Economics requires other social science courses as well, plus six economics electives. The B.S. is a professional degree. In addition to social science electives, it requires ten economics electives and one course in quantitative methods.

The department courses offer training in economic theory, money and banking, public finance, international trade, growth and development, industrial organization, comparative economic systems, economic history, environmental economics, economics of crime, urban problems, labor markets, collective bargaining, human resources, poverty and discrimination, and medical economics. In addition, tool courses, such as statistics, mathematical

economics, econometrics, and quantitative methods, are available. Other electives and reading courses permit students to study an area in depth.

The Minor

The department also offers a minor consisting of four required courses and four electives, which are selected in consultation with a faculty adviser. Any course taken outside the Department of Economics to satisfy these minor elective requirements must be approved by a faculty adviser in the department.

Special Programs

See French for Business and Economics, Business German, Independent Major, International Co-op, Irish Studies Minor, Russian Studies Minor, Trent Polytechnic Institute, Urban Studies Minor, in the Special Programs section, page 78.

Department of History

Raymond H. Robinson, Ph.D., *Professor and Chairman*

Professors

Philip N. Backstrom, Ph.D.
Ballard C. Campbell, Ph.D.
William M. Fowler, Jr., Ph.D.
Donald M. Jacobs, Ph.D.
John D. Post, Ph.D.

Assistant Professors

Ruth-Ann M. Harris, Ph.D.
Gerald H. Herman, M.A.
Patrick Manning, Ph.D.

Associate Professors

Charmarie J. Blaisdell, Ph.D.
Laura L. Frader, Ph.D.
Norbert L. Fullington, Ph.D.
LaVerne J. Kuhnke, Ph.D.
Clay McShane, Ph.D.
Stanley R. Stemberge, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

History's concern with the diverse and complex past of humanity provides an excellent opportunity for the development of greater understanding and appreciation of today's culture and civilization.

Professional Preparation

Traditionally, history has been a major of great appeal to men and women desiring a broad base before they embark on careers in business, law, journalism, and government.

Other students who major in history know that they want to work more directly in history. Some want to teach in public schools. They may elect education courses that may lead to state certification. Those desiring jobs in private secondary schools

need not be certified by state authorities. Teaching positions in colleges and universities require master's and, increasingly, doctor's degrees. An undergraduate who majors in history facilitates his or her entrance to graduate programs in the field. Ordinarily, college and university history teachers spend part of their time in research and writing.

Not all professional historians teach and write. Many find pleasure and profit working in public archives, private historical societies, museums, and restoration projects. These careers serve not only other professional historians but a larger public as well.

The Major

For students of such diverse interests and ambitions, curricula must combine sensible structure with flexibility. Those who major in history at Northeastern may qualify for either a bachelor of arts or a bachelor of science degree. Since the B.A. requires a foreign language, it appeals to prospective candidates for graduate school where reading knowledge of foreign languages is often necessary; the B.S. is designed for students desiring greater specialization in history and a social science orientation.

Candidates for both degrees are required to take the surveys in Western Civilization and American History, and The Historian's Craft, which focuses on methods, problems, and philosophies of historians. A later course, Approaches to History, requires students to undertake a major historical project. Elective courses cover the political, economic, social, and cultural history of man in diverse times and places.

To ensure a broad program of study, the College of Arts and Sciences requires that students choose courses offered by departments outside the area of the major.

The history requirements are broken into groups: Group A (ancient, medieval, and early modern Europe); Group B (modern Europe); Group C (British North American colonies and the United States); and Group D (other areas or regions). A minimum of two courses (eight quarter hours) must be elected from each group.

Students are urged to avoid overspecialization at the undergraduate level. Though there are no maximum limits on the amount of history that may be taken, the department advises broad course selection as the best policy. All students who major in history are assigned to departmental advisers who offer counsel about the program. Students are urged to seek advice about history electives, about other electives, and about the Honors Program.

All students who qualify are urged to consider the Honors Program in history. Those accepted write honors theses under the direction of members of the department. Students ordinarily register for the honors courses in their last three quarters of enrollment, except for the summer quarter when honors courses are not usually offered.

The Minor

Students interested in a minor in history should consult the History Department for information.

Special Programs

See Asian Studies Minor, Independent Major, International Co-op, Irish Studies Minor, New England Quarterly, Russian Studies Minor, Center for the Study of Sport in Society, Trent Polytechnic Institute, Urban Studies Minor, and Women's Studies minor in the Special Programs section, page 78.

Human Services

An interdisciplinary major involving the College of Arts and Sciences and the Boston-Bouvé College of Human Development Professions

John D. Herzog, Ph.D., *Department of Education, Director and Professor*

Advisory Committee

Cathy Cogen, M.A.,
American Sign Language Program

Wilfred E. Holton, Ph.D.,
Sociology and Anthropology

Louise LaFontaine, Ed.D.,
Department of Counseling Psychology, Rehabilitation, and Special Education

Lawrence Litwack, Ed.D.,
Department of Counseling Psychology, Rehabilitation, and Special Education

Barbara Schram, Ed.D.,
Department of Education

Lynn M. Waishwell, Ph.D.,
Department of Health, Sport, and Leisure Studies

Harold S. Zamansky, Ph.D.,
Psychology

Fieldwork Supervisor

Natalie H. Riffin, M.Ed.,
O.T.R.

Degree Offered: Bachelor of Arts

Professional Preparation

This major offers students the opportunity to prepare themselves for possible careers in one of the areas broadly defined as "human services." The program is interdisciplinary. The human services curriculum allows students the opportunity to obtain fundamental attitudes, knowledge, and skills that may lead to meaningful careers in the helping professions as well as to graduate education in a variety of fields.

Students who major in human services through the College of Arts and Sciences may prepare themselves to perform a variety of functions in public and private agencies. Through course work, two quarters of fieldwork experience, and possible co-op jobs, students have the opportunity to explore such areas as: casework services in social service and welfare agencies; therapeutic treatment programs in mental health settings; using American Sign

Language in serving deaf clients; supportive counseling in community health centers; rehabilitation counseling services; sheltered workshops; parole counseling; court liaison in programs for delinquent youth; staff work in halfway houses, penal institutions, and drug treatment centers; supportive counseling for the mentally retarded; community organizing; services for the aging; administration in human services agencies; and social program research and evaluation.

The Major

The human services program offers a continuing advisory system to help students make the best use of their early course selections and to guide them to appropriate upper-level courses.

College Requirements

Degree requirements differ for each participating College. Refer to pages 93 to 95 for requirements in the College of Arts and Sciences and to page 99 for requirements in the Boston-Bouvé College of Human Development Professions. Students in Arts and Sciences may take a five-year Cooperative Education Program or a four-year full-time program.

There are five basic aspects to the program, as follows:

1. Prerequisite courses. Prescribed courses in sociology, psychology, government, economics, and human services are required, for a total of six courses.
2. Core courses. Nine courses in areas including statistics, research methods, group process, organizations, personality, intervention strategies, and a senior seminar are required.
3. Specified electives. Three courses in the areas of African-American studies, special education, and/or poverty must be selected from a list of recommended options.
4. Specialization. Each student must take a five-course specialization developed in conjunction with an adviser. Typically, these specializations are in one of three areas: administrative, community, and clinical. Structured specializations have been developed in deaf studies, aging, administration, and other areas. Specific course choices are designed to complement the individual's interests and goals.
5. Fieldwork. Human services students are required to fulfill two fieldwork placements during the last two years of their program. Students must apply for fieldwork assignments early in the quarter before the fieldwork will be done. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. In the past, students have found placements in community programs, nursing homes, vocational workshops, state and federal agencies, and recreational facilities. These experiences are supervised by University staff to maximize the student's learning opportunity.

The human services major offers students the opportunity to obtain useful values and basic knowledge relating to various human services fields. Courses introducing some basic skills can help them to understand and work with a variety of helping services.

Human services students at Northeastern have been very active in their major and helpful to each other. The Human Services Student Organization combines social and career-related activities, which in the past have included open houses, bake sales, clothing drives, meals for the homeless, social activities, day-long conferences, and weekend retreats. A quarterly *Human Services Newsletter* is published by students and faculty.

The Minor

No minor is offered.

For specific details on degree requirements, students should consult their human services advisers or the program director in 210 Lake Hall. 437-2624.

Special Programs

See American Sign Language, Independent Major, International Co-op, Personality and Social Psychology Concentration, Elementary Spanish for Criminal Justice and Human Services, Trent Polytechnic Institute, Urban Studies Minor, and Women's Studies Minor in the Special Programs section, page 78.

Linguistics

An interdepartmental major

Francois Grosjean, Ph.D. and Doctoral d'Etat, *Professor and Coordinator, Psychology*

Professors

Irene R. Fairley, Ph.D., *English*
 Harlan Lane, Ph.D. and
 Doctoral d'Etat, *Psychology*
 Joanne L. Miller, Ph.D.,
Psychology

Associate Professors

Michael R. Lipton, Ph.D.,
Philosophy and Religion

Assistant Professors

John J. Carroll, Ph.D.,
Psychology
 Janet H. Randall, Ph.D.,
English
 Judy Anne Shepard-Kegl, M.A.,
Psychology

Degrees Offered: Bachelor of Arts, Bachelor of Science

Linguistics is the science of language and is concerned with such issues as how children learn to speak, how we understand and produce language, how language barriers keep people apart and how language ties bring them together, how language is structured and how it is represented in the brain, why some people are better at acquiring a second language than others, and how sign languages are different from spoken languages.

Professional Preparation

Combined with other appropriate courses, a major in linguistics may be a useful first step in becoming, for instance, a linguist, an expert on child language, an interpreter, or even an expert in artificial intelligence. But above all, specializing in linguistics allows the student an opportunity to have an insight into language itself—a highly complex aspect of our everyday life that we take for granted far too readily.

The Major

The major in linguistics is an interdepartmental enterprise. Five departments (English, Modern Languages, Philosophy and Religion, Psychology, and Sociology/Anthropology) collaborate to offer a comprehensive program that makes use of the vast resources and talent that exist at Northeastern University in the field of linguistics. The major reflects the current research of such diverse people as linguists, sociologists, psychologists, language educators, and teachers of second languages. It is administered by a coordinator who is a member of the Psychology Department and the linguistics faculty.

The major offers students a systematic introduction to modern linguistics and is broad enough to meet the needs of students interested in:

- general linguistics (phonetics and phonology, semantics, syntax, bilingualism, historical linguistics, philosophy of language, language and culture, American Sign Language);
- experimental linguistics (language and cognition, child language, neurolinguistics, psycholinguistics); and
- linguistics applied to language-related work (language teaching, language testing, language teaching materials, interpreting, literary analysis).

Students enrolled in the linguistics major can obtain either a bachelor of arts or a bachelor of science degree. These two degrees are in every way identical except that the second language requirement can be met with American Sign Language in the B.S. degree but not in the B.A. degree.

Besides the general college requirements, the requirements of the major include six basic courses from the main areas of linguistics: general linguistics, psycholinguistics, sociolinguistics, and symbolic logic. Students also take five additional courses in the area of their choice. These courses include, among others, Bilingualism, Child Language, Philosophy of Language, Linguistics of American Sign Language, Neurolinguistics, Transformational Grammar, Body Language, Animal Communication, Introduction to Semantics, and Applied Linguistics.

All students also take a laboratory course in which they are introduced to language research in a laboratory environment. Two advanced seminars are required, as is a practicum that can take the form of fieldwork, interpreting, language teaching, or a

directed study. The practicum is supervised by a faculty member who advises the student and monitors his/her progress. Advanced knowledge of a second language—spoken or sign—is required, by either taking appropriate courses or demonstrating proficiency in that language.

Combined with other appropriate courses, the program is suitable for those students interested in teaching American Sign Language. They may wish to concentrate on the applied linguistics of sign language while working on their bachelor's degree. This concentration enables students to acquire the background and the skills necessary to become professional teachers of sign language, and helps them prepare for the sign language instructor certification.

Throughout the course of study, students meet regularly with an adviser who helps them plan their course work and advises them on all aspects of the major.

The Minor

The linguistics program offers students specializing in other disciplines a minor in linguistics. This minor is designed to give students the opportunity to broaden their field of study and to enhance their career opportunities. The minor consists of six courses, two required courses with the remainder selected from a large set of courses offered by the program. Students minoring in linguistics are assigned a faculty adviser to help them select the courses that best suit their needs.

A brochure describing the linguistics minor, as well as additional information, can be obtained from Professor F. Grosjean, Department of Psychology, 282 Nightingale Hall.

Research

The students enrolled in a directed-study course and in the laboratory course will take advantage of the Psychology Department's four language laboratories, which contain audio and video recording facilities and computers for stimulus preparation, data gathering, and statistical analysis. They will work with graduate students, research assistants, and faculty on ongoing projects related to the perception and production of spoken and sign languages.

Special Programs

See American Sign Language, English Minor, Psychology Minor, and International Co-op in the Special Programs section, page 78.

Department of Political Science

Robert E. Gilbert, Ph.D., *Professor and Chairman*

Professors

Robert L. Cord, Ph.D.
David E. Schmitt, Ph.D.

Associate Professors

L. Gerald Bursey, Ph.D.
Minton F. Goldman, Ph.D.
Eileen L. McDonagh, Ph.D.
Suzanne Ogden, Ph.D.

Assistant Professors

Denise L. Baer, Ph.D.
Christopher J. Bosso, Ph.D.
Malcolm Cross, Ph.D.
David A. Dickson, Ph.D.
Phyllis S. Glick, Ph.D.
Duane L. Grimes, M.A.
Margaret E. Leahy, Ph.D.
William F. S. Miles, Ph.D.
Bradley J. Miller, M.P.A.
David A. Rochefort, Ph.D.
Harry Wessell, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science; Bachelor of Science only with a concentration in public administration.

Political science is concerned with the study of political institutions, the social and economic forces that shape them, the cultural context within which they operate, and human behavior in political matters.

The Department of Political Science at Northeastern University has three objectives: (1) to offer students the opportunity to obtain an education within the framework of the best liberal arts tradition; (2) to help heighten students' awareness of political forces in the environment and to sharpen their perception of their role as citizens in a democratic society; and (3) to provide the opportunity for acquiring a solid academic foundation to those who elect political science, law, or public administration as a professional career or who choose a career for which a political science background is relevant or helpful.

Professional Preparation

The study of political science can be the gateway to a liberal education with its benefits of broadened interests, sharpened sensibilities, and a quickened sense of civic responsibility.

Studies in this field can help the student with a special interest in public affairs to prepare for government service, the study of law, the teaching of government and related subjects, a career in politics or public management, or a career in such areas as journalism or international affairs.

For the student who wishes to pursue professional studies at the graduate level, concentration in political science and/or public administration may help lead to many attractive opportunities. As

in many fields, competition for positions is keen, so the student's success will depend upon such factors as academic record, experience, and personal initiative. There are some career opportunities in public management at the federal, state, and local levels of government, while positions in research are often available in government, university, and independent research bureaus. Teaching offers further career possibilities, as do specialized agencies in international bodies like the United Nations, which call for the skills of the political scientist. Individuals with specialized training in political science can compete for positions in less obvious areas: in the public-service programming of educational and commercial television, in journalism, in legislative and lobbying work, in public relations activities with private associations, and in profit and non-profit corporations.

The Political Science Major

Students may select either the bachelor of arts or the bachelor of science degree program in political science. Students in the B.A. program have to meet foreign language and other requirements of the College. Both degree programs require four quarter hours in each of the following: Introduction to Political Science, Introduction to American Government, Introduction to Foreign Governments, Introduction to International Relations, Public Administration, and Political Theory, as well as twenty-four to twenty-eight quarter hours of electives in political science and six electives (twenty-four quarter hours) in the social sciences, with at least one course in at least three of the following: African-American studies, anthropology, economics, history, psychology, or sociology. The B.S. student is required to take eight hours of research methods. Courses in basic math, and FORTRAN and FORGO are also recommended for B.S. students.

The Public Administration Concentration

The bachelor of science program with a concentration in public administration provides a third option for the student. This program requires the completion of forty hours of such courses as Introductory Political Science, American Government, Public Administration, Policy Analysis, Public Personnel Administration, Public Budgeting, Organizational Theory, and other courses relevant to the field. Students must also complete at least sixteen quarter hours of public administration electives.

In addition, they must complete twenty-four hours of electives in the social sciences, at least eight of which should be in economics. Interested students may undertake, for academic credit, a directed-study project based on an internship experience in a government agency.

The Minors

A minor in political science is available to interested students. It entails successfully completing seven political science courses, at least two of which must be from the following: Introduction to

Politics, Introduction to American Government, Introduction to International Relations, Introduction to Foreign Governments, or Public Administration.

A minor in international politics is also available. It requires successful completion of seven courses in international and/or comparative politics including Introduction to International Relations and Introduction to Foreign Governments and Societies.

Special Programs

See Asian Studies Minor, Independent Major, International Co-op, Irish Studies Minor, Russian Studies Minor, Trent Polytechnic Institute, Urban Studies Minor, and Women's Studies Minor in the Special Programs section, page 78.

Department of Psychology

Harlan L. Lane, Ph.D., *Doc. es Lettres, Professor and Acting Chair*

Professors

John C. Armington, Ph.D.
Francois Grosjean, Ph.D., *Doc. es Lettres*
Helen S. Mahut, Ph.D.
Joanne Miller, Ph.D.
Bertram Scharf, Ph.D.
Alexander A. Skavenski, Ph.D.
Harold S. Zamansky, Ph.D.

Assistant Professors

Adam Reeves, Ph.D.
Judy Shepard-Kegl, M.A.
James R. Stellar, Ph.D.

Clinical Associate Professor
Karen Gould, Ph.D.

Adjunct Associate Professor
Lawrence Stoddard, Ph.D.

Associate Professors

Edward A. Arees, Ph.D.
Martin L. Block, Ph.D.
Roger Brightbill, Ph.D.
John J. Carroll, Ph.D.
Perrin S. Cohen, Ph.D.
Stephen G. Harkins, Ph.D.
Charles Karis, Ph.D.
Harry Mackay, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The science of psychology may be broadly defined as enquiry into why people and animals behave as they do. Psychology is an interdisciplinary science that depends heavily on the methods and much of the knowledge derived from the other natural and social sciences.

The psychology curriculum explores many topics, such as the function of the brain in determining behavior; how we see, hear, and learn; what behavioral science can offer in the problem areas of mental retardation, personality problems, infancy, and old age; and how we might suggest social changes based on laboratory

data to increase men's and women's accomplishments and satisfactions in the modern world. In addition, the curriculum offers opportunities for laboratory practice and experimentation, field experiences in behavior technology, and small-group seminars to encourage critical and creative evaluation of psychology's accomplishments and its future.

Professional Preparation

The undergraduate curriculum offers students the opportunity to develop a sound foundation in the scientific underpinnings of modern psychology to prepare them for a diversity of careers in teaching, research, public service, and professional practice. It also offers students the opportunity to prepare to enter a variety of work settings in which in-service specialty training is ordinarily offered (e.g., community mental health centers, vocational rehabilitation offices, and correctional programs) or to enter advanced training in such graduate programs as psychology, life science, or any of the health professions and medical specialties.

The Major

The department offers both a bachelor of arts and a bachelor of science degree. The B.S. degree is usually recommended for students with a strong scientific or professional interest who may consider applying to graduate schools in psychology or environmental science. In addition, the department offers a special B.S. program for psychology majors who wish to prepare for application to health professions schools. Since modern psychology is multidisciplinary, the B.A. and B.S. programs both include distribution requirements in allied sciences to fulfill the need for wide exposure to varying techniques of scientific practice and interpretation.

With the science courses and elementary psychology courses as foundations, students in the B.A. and B.S. programs may pursue a general course of study that explores four major areas of psychology: language and cognition, learning motivation and behavioral analysis, personality and social psychology, or sensory and neuropsychology. Alternately, students may choose to concentrate in only one of these areas. The curricula for the areas of concentration have been structured so that the student often takes courses not only in psychology, but also in related disciplines. For example, a student concentrating in personality and social psychology takes courses in sociology, anthropology, and speech/drama. The student's final choice of concentration should be made only after personal consultation with his or her Psychology Department adviser.

Within each of the four concentrations, the student is expected to progress through a sequence of specialty courses, laboratory courses, and a seminar. The student is thus afforded the opportunity to explore a given area of psychology in depth, as well as to acquire an overview of the broader issues in psychology. Furthermore, all B.S. students and qualified B.A. students participate in

the department's Directed Studies Program in which, under the direction of a faculty member, they engage in research projects in various laboratories. In this way, classroom learning is complemented by laboratory research, where the student may learn by doing.

The Minor

Each student is required to take ten psychology courses, including the introductory psychology sequence, intermediate specialty courses, and at least one laboratory course. The minor program itself is quite flexible, designed for students with a broad range of interests and career goals. Students may choose either to distribute the ten psychology courses over a broad range of areas or to focus on one of the four areas corresponding to the major concentrations: language and cognition, learning motivation and behavioral analysis, personality and social psychology, and sensory and neuropsychology. Students are assigned faculty advisers in the department to help them select the minor program that best suits their needs.

Honors Program

All psychology majors who are academically eligible to participate in the Honors Program are encouraged to do so. See page 250 for details about the program for highly motivated and successful students.

Topics in Psychology Series (TIPS)

As well as offering courses designed primarily for psychology majors, the department offers a variety of courses without prerequisites that are addressed to specific topics of broad current interest. Examples include Psychological Testing, Marriage and the Family, Body Language, Sexual Behavior, Psychology and the Law, Animal Communication, Man in Isolation, and Memory and Remembering.

Research Laboratories

The student who enrolls in laboratory courses and directed-study courses will take advantage of the department's resources for research, which include: (a) in the field of learning and motivation, behavior laboratories for research with humans, rats, and pigeons; and, in collaboration with the Walter E. Fernald State School, an instructional setting for research and training in behavior modification with retarded children and adults; (b) in neuropsychology and ethology, primate and rodent surgeries in neuroanatomical and histological laboratories, with apparatus for stimulating and recording activities of the brain; (c) in the psychology of vision and hearing, specialized enclosures and equipment for presenting visual and auditory stimuli and for measuring responses of the eye and the ear, including on-line computers; (d) in language and cognition, audio and video recording facilities and a computer for control of stimulus and response variables; and (e) in the field of personality, darkrooms, tachistoscopes, and an eye-movement camera.

Special Programs

See American Sign Language, Independent Major, International Co-op, Linguistics Minor, Personality and Social Psychology Concentration, Combined Program with Professional Schools, The Center for the Study of Sport in Society, and Women's Studies Minor in the Special Programs section, page 78.

For additional information regarding degree requirements, laboratory research opportunities, special academic programs and career opportunities for psychology majors, students should go to Room 282 Nightingale Hall or call 617-437-3076.

Department of Sociology/Anthropology

M. Patricia Golden, Ph.D., *Associate Professor and Chair*

Professors

Morris Freilich, Ph.D.
Debra R. Kaufman, Ph.D.
Elliott A. Krause, Ph.D.
Jack Levin, Ph.D.
Morton Rubin, Ph.D.
(Emeritus)
Earl Rubington, Ph.D.

Associate Professors

Arnold Arluke, Ph.D.
Richard Bourne, Ph.D.
Winifred Breines, Ph.D.
Wilfred E. Holton, Ph.D.
Thomas H. Koenig, Ph.D.
Ronald J. McAllister, Ph.D.
Carol A. Owen, Ph.D.
Thomas M. Shapiro, Ph.D.

Assistant Professors

Christine Gailey, Ph.D.
Herman S. Gray, Ph.D.
Maureen Kelleher, Ph.D.
Alan M. Klein, Ph.D.
Bruce K. MacMurray, Ph.D.
Judith Perrolle, Ph.D.
Michael Rustad, Ph.D.
Carmen J. Sirianni, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The disciplines of sociology and anthropology apply a critical perspective to the study of social arrangements in which human beings live and die. Systematic research methods and theory are brought to bear on how societies function and change, and on how individuals, groups, and institutions interact. Such areas as social policy, criminology, medical and mental health issues, and business issues are studied.

Professional Preparation

A major in this department offers background preparation and preprofessional training for a wide spectrum of careers in public or private service and research. Students may wish to pursue graduate study in sociology, anthropology, or social psychology.

For those pursuing graduate, professional training (e.g. law, social work, and public administration), sociology and anthropology also provide a good background.

Those enrolled in premedical, prelegal, paramedical, or other preprofessional programs should find that sociology and anthropology courses can offer a useful background.

The Majors

Students may major in sociology or anthropology or both. Students who wish to study both must design their own programs, with the help of an adviser.

Students may follow either a four-year full-time program or a five-year cooperative course of study. Cooperative work assignments vary from placement in mental hospitals and social agencies to placement in university, government, and other research and policy-making settings. Transfer between the five-year co-op program and the four-year full-time program is possible, and registration in either is not an irreversible decision.

The department offers both a bachelor of arts and a bachelor of science degree. The requirements for each degree, both in sociology and in anthropology, are outlined below. A student with specific goals may, of course, take more departmental electives than are required. B.A. students may wish to look at the specialization requirements for B.S. students and consult their advisers for assistance in planning programs with specialized goals.

The department offers a B.S. with majors in anthropology or sociology. Students selecting this option must fulfill all the major requirements set by the department for the B.A. degree and must take a coherent program involving additional course work as outlined below. Specializations are interdisciplinary and involve more intensive study within a concentration.

Anthropology

B.A. students in anthropology must take at least forty-eight quarter hours in departmental courses, including forty in anthropology and eight in sociology. The exact distribution can be arranged. Minimum requirements are as follows:

1. Preparatory—Introduction to Anthropology and Introduction to Sociology. (Students with equivalent background who intend to major in anthropology may be exempted. Students should consult a departmental adviser.)
2. Core requirements—at least three of the following, as available: Language and Culture; Individual and Culture; Human Origins; Myth and Religion; Sex, Sex Roles, and Family; and Archaeology.
3. Electives—Students must take at least six additional electives in anthropology and at least one additional elective in sociology. Qualified students are encouraged to take relevant graduate

courses with the consent of the instructor. Students majoring in anthropology should freely consult their advisers since courses elsewhere in the University may round out a special interest or focus.

4. Nondepartmental requirements—Six courses from the following social sciences: African-American studies, economics, history, political science, and psychology.

B.S. students in anthropology take the same basic core of courses and, in addition, an individually designed specialization in an area of interest consisting of at least five courses. Students *must* confer with an adviser who will help develop such a program, place it on record, and supervise it. Interdepartmental and interdisciplinary specializations can be arranged in such areas as linguistics, Native American studies, biological anthropology, psychological anthropology, or area studies focusing on Latin America, Africa, Asia, or the Middle East.

Sociology

B.A. students in sociology must take at least fifty-two quarter hours in departmental courses, including forty-four in sociology and eight in anthropology, and must meet the following minimum requirements:

1. Preparatory—Introduction to Anthropology and Introduction to Sociology. (Students with equivalent background who intend to major in sociology may be exempted. Students must check with a departmental adviser.)
2. Core requirements—Statistical Analysis; Research Methods I; Research Methods II; Classical Social Thought; Current Social Thought; Class, Power, and Social Change.
3. Electives—The following are minimum requirements: two intermediate courses, (at 100/200 level, excluding Introduction to Sociology); two advanced courses, (courses at 300 level or above); and one intermediate or advanced anthropology course. With the adviser's consent, qualified students are encouraged to take certain graduate and directed-study courses and/or the Senior Majors Seminar.
4. Nondepartmental requirements—Six courses from the following social sciences: African-American studies, economics, history, political science, and psychology.

B.S. students in sociology take the same basic core of courses as B.A. students and, in addition, an individually designed specialization in an area of interest consisting of at least six courses, some from within and some from offerings outside the department. Students *must* confer with an adviser who will help develop such a program, place it on record, and supervise it. *It is possible to arrange specializations focusing on social welfare, health services, political studies, urban studies, education and society, ethnic studies, and organizational studies.* There are, of course, many other areas of specialization and possible combinations of courses. The following offer a few examples (courses in the Department of Sociology/Anthropology are indicated by an asterisk):

Social Welfare

Sociology of Poverty*

Social Policy and Social Intervention*

Sociology of Human Service Organization*

Private and Public Assistance*

The Welfare System in America

Income Inequalities and Discrimination

Politics of Poverty

Health Services

Medical Sociology*

Death and Dying*

Health Care as a Social Issue*

Culture and Mental Illness*

Aging and Society*

Sociology of Mental Health*

Medicine, Religion, and the Healer's Art

Medical Economics

Community Medicine and Health-Care Delivery

Human Services Administration

Urban Studies (Contact the College of Arts and Sciences for information on the Urban Studies interdisciplinary minor.)

Cities and Society*

Community Analysis*

Suburb and Metropolis*

Seminar in Urban Studies*

Urban Politics

Urban Economics

The Economics of Urban Poverty

American Urban History

Architecture and the City

Law and Society

Law, Crime, and Social Justice*

Sociological Theories of Crime*

Social Policy and Social Intervention*

Civil Liberties

Law and Society

The Economics of Crime

The Politics of the Criminal Justice System

* Departmental Course

Occupations and Professions

Occupations and Professions*

Sociology of Work*

Social Roles in the Business World*

Medical Sociology*

Labor Market Economics

History of the Professions

Sex Roles and Family

Sex, Sex Roles, and Family*

Sociology of the Family*

Kinship and Society*

Sex-Gender Roles in a Changing Society*

Violence in the Family*

Sex Roles in American Politics

Women in Modern Europe

The Black Family

Organizational Studies

Sociology of Business and Industry*

Sociology of Work*

Administration and Formal Organization*

Social Policy and Social Intervention*

Social Roles in the Business World*

Human Services Organization*

Organization Theory

People in Organizations

Deviance

Social Deviance*

Drugs and Society*

Sociology of Alcoholism*

Juvenile Delinquency*

Sociological Theories of Crime*

The Disordered Mind

Abnormal Psychology I, II

The Female Offender

Social Psychology

Social Psychology (Sociology, Psychology Departments)*

Anthropology of Aggression*

Group Behavior I, II*

* Departmental Course

Seminar Social Psychology*
 Personality
 Psychology Laboratory/Social Psychology
 Psychology Laboratory/Personality
Popular Culture and Mass Communication
 Mass Communication and Public Opinion*
 Collective Behavior*
 Leisure, Sport, and Society*
 The Sociology of Everyday Life*
 History of Media in America
 The Automobile in America
 Survey of African-American Music
 Popular Culture

These are samples of approaches to particular areas; there are many other possible combinations of courses as well as many other areas of specialization.

The Minor in Anthropology

In addition to its major program, the department also offers students majoring in other disciplines the opportunity to take a minor in anthropology. The minor program consists of the following:

1. Introduction to Social Anthropology
2. Language and Culture
 Individual and Culture
 Sex, Sex Roles, and Family
3. Any two-course specialization in anthropology arranged between the student and adviser.
 For other minors see Special Programs, page 78.

The Minor in Sociology

In addition to the major program, the department also offers students majoring in other disciplines the opportunity to take a minor in sociology. The minor program consists of the following:

1. Introduction to Sociology
2. Two courses from among
 Research Methods I
 Research Methods II
 Classical Social Thought
 Current Social Thought
3. Any three-course specialization in sociology arranged between the student and the adviser.

* Departmental Course

Special Programs

See Asian Studies Minor, International Co-op Experience, Personality and Social Psychology, Russian Studies Minor, Trent Polytechnic Exchange Program, Urban Studies Minor, and Women's Studies Minor in the Special Programs section below.

Special Programs in the College of Arts and Sciences

Reflecting the awareness that ideas, fields of study, and interests do not always fall into traditional, neatly compartmentalized units, the College of Arts and Sciences makes a wide variety of special programs available to its students. Field-study programs, international work/study opportunities, interdisciplinary majors and minors, involvement with professionals—all are among the options available to students who meet the program eligibility requirements. Students who participate in these programs find their educational experience at Northeastern greatly enhanced. Detailed information about these programs is available from involved departments and the Dean's Office.

Availability of all special programs is contingent upon minimum enrollment requirements and, when an outside institution is involved, continued affiliation of that institution with the University.

Minors

The College of Arts and Sciences offers to all upperclass students in the College of Arts and Sciences, as well as to students in other colleges in the University, several choices of minors. Below is a list of all those minors. Descriptions of those which are offered through one department are found in the section of this publication for that department; descriptions of interdisciplinary minors, those indicated with an asterisk, are found in this Special Programs section.

African-American Studies

Asian Studies*

Anthropology

Art

Biology

Business*

Chemistry

Economics

English (with options in Literature, Expository and Creative Writing, and Technical Communication)

Film Studies*

Geology

History

Linguistics*

Marine Studies*
 Media Studies*
 Modern Language (with options in French, German, Italian, Russian, and Spanish)
 Music
 Philosophy
 Physics (and Instrumentation for Science)
 Political Science (and International Politics)
 Psychology (with options in Language and Cognition; Learning, Motivation and Behavioral Analysis; Personality and Social Psychology; Sensory and Neuropsychology)
 Russian Studies*
 Sociology
 Speech Communication
 Technical Communication*
 Theatre
 Urban Studies*
 Women's Studies*

American Sign Language Program

American Sign Language (ASL) is the primary language used by the Deaf community in the United States and parts of Canada. A language expressed through gesture and perceived visually, ASL is not patterned after, nor derived from, English or any other spoken language—it is entirely different. Having its own means of expression, wit, poetry, and rich folklore, ASL reflects the thoughts, cultural values, and experiences of Deaf people. A knowledge of ASL is one prerequisite for acceptance into the Deaf community; it is essential for those who have a personal or professional interest in interacting with Deaf individuals.

The Northeastern University Sign Language Programs, affiliated with the Department of Modern Languages, offers both day and evening courses in ASL conversation and interpretation. Courses in the structure of ASL, Deaf culture, Deaf history, ASL literature and ASL linguistics, and sign language teaching are also among the programs offered. The content of the conversation courses is designed to include features typically found in second-language curricula: vocabulary, grammatical structure, and the culture of the target language group. A segment of each course provides an opportunity for students to interact directly with Deaf people, observe ASL in use, and practice their signing skills. The program also makes use of instructional media for individualized practice on receptive skills and vocabulary review.

Related Degree Programs

American Sign Language courses are an integral part of two undergraduate degree programs: the Bachelor of Arts in Human Services with a specialization in Deaf studies and the Bachelor of Arts and Bachelor of Science degrees in Linguistics. A combination of coursework from the ASL and human services programs,

the Deaf studies specialization within the Human Services Program addresses an increasing need for human services professionals with skills and knowledge of American Sign Language and the Deaf community. Students interested in working with Deaf people in a variety of social service situations may consider a B.A. degree in this area. See also Human Services.

The linguistics major is a comprehensive introduction to the study of language reflecting the research of linguists, sociologists, psychologists, language educators, and teachers of second languages. The major offers the special opportunity to work toward a B.A. or a B.S. degree focusing on American Sign Language or applied areas of ASL linguistics. See also Linguistics.

Interpreter Training Program

During the summer, Sign Language Programs offers intensive training opportunities for beginning sign language interpreters. The Summer Program for the Training of Sign Language Interpreters is a rigorous introduction to the field of inter-cultural communication between Deaf and hearing people. Among the theoretical and practical content areas addressed in the course are consecutive and simultaneous interpretation, ethics and interpreter role, public speaking, and interpretation for special populations and in special settings. Applicants must provide evidence of proficiency in English and ASL, as well as extensive experience in the Deaf community.

Sign Language Teacher Training Program

As the New England regional training program under the National Association of the Deaf National Consortium of Programs for the Training of Sign Language Instructors, Northeastern University offers programs to train teachers of ASL. The Summer Program for the Training of Sign Language Instructors offers an intensive introduction to the professional teaching of ASL as a second language. It is designed for current and prospective teachers who are already fluent in ASL.

Visiting Students Program

Northeastern also offers programs at both the undergraduate and graduate levels for students who wish to visit the University and become involved in an intensive exposure to ASL linguistics. These students have the opportunity to take courses in linguistics and ASL, as well as participate in directed studies through which they may take part in ongoing ASL research projects in the Language and Cognition Laboratory of the Psychology Department.

Boston Architectural Center Affiliation

Northeastern University students wishing to take courses at the Boston Architectural Center (BAC) may do so through the affiliation between the BAC and the University's Department of Art and Architecture.

The BAC is one of the country's oldest and most respected architectural schools. It is a nationally recognized leader in providing full-time concurrent work-study opportunities for those interested in careers as practicing architects. Besides being an independent, fully accredited, degree-granting institution, it is the home of the Boston Society of Architects. As such, it serves as a principal focus for a variety of professional activities in the New England area.

The BAC is conveniently located within a short walking distance of the University's Huntington Avenue campus. The NU/BAC affiliation provides choices of courses at either location, with day classroom courses mainly at the University and evening classroom and studio courses at the Center. For studio courses, the Art and Architecture Department's course 27.205, Introduction to Architectural Design (or equivalent) is a prerequisite.

Interested individuals should contact the program coordinator in the Department of Art and Architecture, Professor Peter Serenyi, 401 Ruggles Hall.

Boston Lyric Opera Affiliation

The Boston Lyric Opera is a professional opera company dedicated to providing performance opportunities for New England singers, directors, and designers. The company performs an annual season of fully staged opera productions. The Boston Lyric Opera presents all its performances at the University's Alumni Auditorium. The company's director brings his knowledge and experience in the opera world as an adjunct lecturer in the Fine Arts Division.

Business German Course

This course taught in English is designed for students of business and economics seeking to develop competence in the reading and understanding of texts produced by the German business community and trade media. Course goals include:

1. a working knowledge of grammatical structures and terminologies used in business writings;
2. development of effective comprehension procedures used by professionals for efficient reading;
3. introduction to the Federal Republic of Germany, its industrial geography, trade relations with the United States, and its role as a major partner in international commerce.

Readings from English-language trade publications assure a steady influx of outside information and serve as the basis for weekly summary assignments designed to upgrade students' writing skills.

Students may use this course as a prerequisite to the conversation-based German offerings if speaking competence is needed for a business-oriented co-op in Germany (see International Cooperative Education) as part of Northeastern's exchange program. Additional information may be obtained from Professor Ross Hall in the Modern Languages Department.

Business Minor

The College of Business Administration, in collaboration with the College of Arts and Sciences, offers a minor in business for all students outside the College of Business Administration. This minor may be valuable to students seeking jobs both before and after graduation, in either the public or the private sector.

The courses in the minor cover substantially the areas of business required by the American Assembly of Collegiate Schools of Business as part of the relevant "common body of knowledge."

The business courses included (with one exception, Accounting) are the same as those taken by all students in the College of Business Administration. Thus, the minor should encourage a cross-fertilization of ideas that will be beneficial to both CBA and non-CBA students.

For details, including full requirements and program admission standards, interested persons should consult the Undergraduate Programs Office of the College of Business Administration.

Asian Studies Minor

The Asian Studies minor draws together studies in the departments of Art, History, Modern Languages, Philosophy/Religion, Political Science, and Sociology/Anthropology. Course offerings include history, language, philosophy and religion, political science, sociology, and anthropology. Courses focus on individual Asian countries, the region as a whole, or specific issues applicable to Asian life in an attempt to foster a deeper understanding of Asian societies and cultures.

Center for Humanities

The Center for the Humanities at Northeastern University supports teaching and research activities in cross-disciplinary areas that connect the traditional humanities with science and mathematics, and with such professional curricula as engineering, business, criminal justice, and allied health. Though it offers no courses, the center promotes the application of human-values perspectives and problem-solving techniques to the professions in various conferences, workshops, and presentations. The center is located in 400 Meserve Hall.

The Center for the Study of Sport in Society

The Center for the Study of Sport in Society, the first of its kind in the nation, was established to address the abuses of athletes' education and rights. The center has already established a university degree completion program for current or former professional athletes and has formal agreements with the players association in the NBA, NFL, USFL, NHL, and the two soccer leagues. The center is the hub of a national consortium of universities for the UDCP. There are currently eleven members of the consortium, with a possible twenty-five members for 1986-87. The center has also established a North American Faculty Affiliates network of eighty of the nation's top sports scholars who address and research the various academic areas of sport studies. The center

sponsors seminars; it sponsors a broad-based curriculum in sport and social issues; it gives annual awards for excellence in sports journalism, both in print and electronic media; and it promotes campus-wide lectures, forums, and news conferences. Two journals are also published through the center: *The Journal of Sport and Social Issues* and the *ARENA Review*.

The director of the program is Dr. Richard Lapchick, author, scholar, and civil rights activist. Thomas "Satch" Sanders, former Boston Celtics player and coach of Harvard's basketball team, is the associate director. Keith Lee, a six-year veteran of the NFL, is the public school outreach coordinator. Robert Lipsyte, a veteran sports reporter and columnist now with CBS television news, is the senior fellow.

Combined Program with Professional Schools

Students who have completed at least three-fourths of the course work required for a baccalaureate degree in the College of Arts and Sciences and are accepted into an approved professional school of dentistry, law, medicine, optometry, osteopathy, or veterinary medicine will be eligible for the bachelor of arts or bachelor of science degree at the end of their second year in professional school. At least two-thirds of work for the baccalaureate degree must be earned in residence at Northeastern, and all other College of Arts and Sciences requirements must be fulfilled, the residence requirement having been completed prior to entrance into the professional school. Under this program, a preprofessional student may reduce by one year the time normally required for obtaining both the undergraduate and professional degrees.

Division of Fine Arts

The Division of Fine Arts serves as a focus for the arts at Northeastern by coordinating the University's academic and performing arts activities. Comprising the departments of Art and Architecture, Theatre and Dance, and Music, the division was established in 1981 to enrich and expand the role of the arts at Northeastern. The division develops arts curricula through the support of existing programs, creates interdisciplinary courses to provide a forum for intellectual stimulation and professional development, and generates programming in both traditional and experimental art forms.

As the producer of professional arts events at Northeastern, the division offers a broad range of programs in film, music, dance, literary arts, visual arts, theatre, and performance art. A year-round schedule of events for both University and Boston audiences includes gallery shows, dance performances, artistic residencies, concert series, and theatrical presentations.

To fulfill its role as an arts service organization, the division administers an on-campus professional box office, a corridor art gallery, and an arts publications program. The nuArts Ticket and Information Center in the lobby of the Ell Building provides tickets to all University-sponsored arts events as well as passes and

discount tickets to area museums, theatres, and arts organizations. The division's publications include the *nuArts Calendar*, a quarterly preview of events; *New Music-Boston*, a contemporary music listing for the Boston area; *Essays on Modern Music*, a journal covering topics in contemporary music; and numerous programs, brochures, and catalogs.

Affiliations with local and national arts groups enable the division to expand and strengthen the scope of arts activities at Northeastern. The Boston Lyric Opera, the Boston Theater of the Deaf, and the Boston chapter of the League of Composers—International Society For Contemporary Music work through the division's auspices to produce full seasons of performances on campus.

To ensure that the arts remain an important and vital part of the University and its community, the Northeastern University Division of Fine Arts encourages both academic excellence and professional achievement. By sponsoring new-works commissioning programs, by presenting important emerging artists, and by incorporating contemporary notions of the role of the artist in society, the Division of Fine Arts maintains an important position in the cultural and educational life of this modern urban university.

The African-American Master Artists-in-Residency Program at Northeastern is also an important part of the Division of Fine Arts. The only program of its kind in the country, AAMARP is dedicated to providing its constituencies with the best aesthetic presentations possible from the widest spectrum of artists available. To that end, while its artistic residencies are limited to persons of color, its galleries and community spaces are open to all. Since 1978, the AAMARP facilities have housed dozens of African, Asian, Hispanic, European, and Native American exhibitions from artists in the Boston area and throughout the nation.

East/West Marine Biology Program

The East/West Marine Biology Program is a joint project of Northeastern University and the University of Oregon, which allows advanced undergraduate and beginning graduate students of biology to spend an exciting year of field study in three very different marine environments: coastal Oregon, Jamaica, and New England. This program is open to Northeastern University and University of Oregon students, as well as to students from other colleges and universities, as space permits.

The program begins in the fall on the coast of Oregon, noted for its large algae, stunning marine invertebrates, and numerous fish, birds, and marine mammals. While living at the Oregon Institute of Marine Biology, students study basic marine botany and invertebrate and vertebrate zoology. These courses offer students the opportunity to build a foundation for a better understanding of the comparative courses in tropical and east coast marine biology that follow.

In January, students move to Jamaica to study tropical biology at a marine laboratory on the north coast of the island, near the town of Ocho Rios. The lab is located on the beach within walking and swimming distance of rich coral reefs and sandy bays interspersed with beds of turtle grass. Courses focus on the tropical environment, building on the West Coast experience and emphasizing the comparative aspects of field biology. Visits to the interior of the island and lectures on its terrestrial aspects are an important part of the program.

Students who have lived and worked together in Oregon and Jamaica travel for the final phase of the program to Northeastern University. Students live in University or private housing but spend most of their time at the Marine Science and Maritime Studies Center at East Point, Nahant, just north of Boston. The laboratory is located on several acres of open land at the end of a rocky point extending into the Atlantic Ocean. Courses here focus on the marine plants and animals of New England while emphasizing advanced and comparative aspects of biology.

**Elementary Spanish Course
for Criminal Justice and
Human Service Majors**

This course is intended for students majoring in criminal justice or human services who will need to use Spanish in police work and in social service settings. The grammar taught is the same as in other elementary Spanish courses. The vocabulary is adapted in particular needs and interests of the students. Role-play is used extensively and students practice "intake" interviews in the course.

Film Studies Minor

Film Studies permits students to acquire skills in the analysis of one of the major art forms and cultural influences of the twentieth century and gives students the opportunity to develop critical tools that can be used to study the relation between film and society, history, aesthetics, philosophy, and psychoanalysis. Film Studies courses are selected from the departments of Art and Architecture, English, History, Modern Languages, and Speech Communication. In addition to satisfying requirements in film analysis, film theory, and filmmaking, students pursuing a minor choose courses from departmental offerings. The Film Studies minor offers the opportunity of extending knowledge and insights from other fields into a new medium. The program may also serve as an introduction to film for the student interested in graduate study in film scholarship and/or filmmaking.

**French Course for Business
and Economics Students**

Elementary French for Business and Economics students is designed for students who wish to study French with the intent of enhancing their career opportunities. The program is particularly aimed for students interested in international business. It offers, along with a thorough study of grammar and insights into the French way of life, some specialized vocabulary related to the business world and an immediate introduction to French business

texts. The course serves as a preliminary step for the student wishing to gain co-op placement in France. Additional information may be obtained from Juliette Gilman in 362 Holmes Hall.

Independent Major

After their second quarter in residence, students may petition the Dean of the College of Arts and Sciences for an independent major. The independent major is available particularly for students whose academic or professional goal cannot be met by any of the established programs in the College. Students interested in this option work on a detailed major proposal with faculty advisers and submit the proposal to a counselor in the Dean's Office and to the College curriculum committee. The proposal must fulfill all College requirements and must center on a discipline or combination of disciplines in the Arts and Sciences. Discussion of the proposal with a counselor in the Dean's Office prior to submission is recommended.

International Cooperative Experience

Northeastern extends its unique Plan of Cooperative Education to the international scene by offering qualified upperclass students the opportunity for suitable international placement. This program operates on an exchange basis in cooperation with overseas institutions and sponsoring agencies. Students whose academic, linguistic, and professional experience make them attractive candidates for overseas positions may work in Great Britain, Sweden, Ireland, Canada, and the French- and German-speaking countries of Europe. By creating a mutually beneficial situation for students and employers, the program helps to meet an increasing need for qualified professionals who possess international expertise and language proficiency necessary to assist companies in expanding their overseas markets. Students may obtain detailed information about the program from the Department of Modern Languages or the International Cooperative Education Office, 502 Stearns Center.

Irish Studies Program

The Irish Studies Program promotes Irish Studies at Northeastern University through expansion of the curriculum, cultural programs on Ireland and Irish-America and co-operative exchanges of Irish and American students for work and study. The Distinguished Speakers Series presents opportunities for University faculty and staff to develop mutually beneficial relationships with Irish counterparts in all disciplines. The committee is representative of and encourages cooperation with all departments of the University.

The program includes a research project which is a database on characteristics of Irish immigrants in North America. When completed, the project will provide a rich source of data on the origins, arrival, and migration patterns of the Irish in America. The

data is drawn from a missing persons column which ran in the *Boston Pilot* from 1831 through 1916. Volume One, which consists of 4,788 entries (1831–1850), was published by the New England Historic Genealogical Society in 1986.

Through International Co-op, students are placed in various businesses and agencies in the Republic of Ireland and in Northern Ireland. The Working Papers in Irish Studies Series provides an opportunity to disseminate manuscripts of current interest. Cultural efforts include a film series, development of a library collection, and art exhibitions, as well as student activities in the Irish Student Club. Plans to develop an interdisciplinary minor are underway. Dr. Ruth-Ann Harris, Department of History, is the Director of the Irish Studies Program.

**League of Composers—
International Society for
Contemporary Music
Affiliation**

Northeastern University is the home of the Boston chapter of the League of Composers—International Society for Contemporary Music, one of the oldest and most prestigious international organizations dedicated to the promulgation of new music. With chapters in more than forty countries and with a membership that has included Schönberg, Stravinsky, Bartók, and Ravel, the League —ISCM has introduced to the public works of some of the most important composers of the twentieth century. Under the direction of Professor Dennis Miller of the Northeastern Music Department and through the auspices of the Division of Fine Arts, the league's activities at Northeastern include the presentation of an annual concert series featuring the finest interpreters of the contemporary idiom, co-sponsorship (with the Department of Music) of the annual Leo Snyder Memorial Award in Composition, production of New Music-Boston, a calendar listing of Boston new music activities, and publication of *Essays on Modern Music*, an annual monograph series featuring articles on topics in contemporary music written by composers and new music scholars and critics.

Linguistics Minor

In collaboration with four other departments—English, Modern Languages, Philosophy and Religion, and Sociology/Anthropology—the Psychology Department offers the linguistics minor, which reflects the current research of such diverse people as linguists, sociologists, psychologists, language educators, speech pathologists, neurologists, and teachers of second languages. The minor in linguistics complements the study of any other language-related area such as computer science, anthropology, brain physiology, or language teaching. Specialized concentrations within linguistics include psycholinguistics, stylistics, language and culture, second language teaching and applied linguistics, theoretical linguistics, and American Sign Language linguistics. Many research opportunities exist through directed work study.

Marine Studies Minor

The marine studies minor reflects the educational resources and maritime heritage of New England and offers the undergraduate student the opportunity for an unusual focus in a liberal arts education. Study of the oceans demands an integrated interdisciplinary approach. The marine studies minor is structured to allow a primary, although not exclusive, emphasis on either the scientific or the social science/humanistic study of the oceans. Some physical interaction with the sea is required through demonstrated achievement in a specific marine-related skill such as scuba diving, sailing, or piloting/navigation. The minor is not the principal preparation for employment in marine related positions but rather an opportunity to enrich a liberal education. Full information is available from the director of the Marine Science and Maritime Studies Center.

Massachusetts Bay Marine Studies Consortium

Northeastern University is a member of the Massachusetts Bay Marine Studies Consortium. The consortium serves the students and faculty of twenty-two Boston-area colleges and universities. The courses are interdisciplinary and seek to bridge the gap between academic disciplines and to address current concerns in the marine world. The consortium catalog includes a fall course, *A History of Seafaring*, a look at cultures and societies of the past as reflected in their maritime activities; and three winter courses—*Water, Water*, an interdisciplinary survey of water-related problems in their cultural, political, economic, technological, and scientific complexity; *Into the Ocean World*, an interdisciplinary introduction to marine studies; and *Marine Mammals*, taught at the New England Aquarium.

For further information contact the University's consortium representative, the director of the Marine Science and Maritime Studies Center.

Marine Studies and Maritime Studies Center Summer Program in Marine Biology

The summer program allows undergraduate and graduate students from Northeastern and universities all over the country to participate in intensive courses at MSMSC. Summer course offerings include an introduction to Marine Biology, Benthic Marine Ecology, Adaptations of Marine Organisms, Biomechanics, Biology of Marine Vertebrates, and Behavior and Neuroethology of Marine Animals. The ready availability of field sites and the ease of collections of marine organisms make the MSMSC laboratory an attractive site for teaching courses related to the marine environment. Courses at the laboratory emphasize field biology and the use of living marine organisms in laboratory-based courses.

Graduate students and undergraduates conduct independent research at the MSMSC laboratory in the summer and throughout the year. Resident and visiting faculty supervise a wide variety of research topics and graduate students from other universities are encouraged to use the laboratory and field sites for their thesis research.

Media Studies Minor

We live in a media-oriented society in which political outcomes and social values are affected, if not determined, by the mass media. Students who pursue the media studies minor examine the media from a number of perspectives. Media studies courses are selected from the departments of political science, music, speech communication, journalism, art, drama, history, and English. Each student satisfies requirements in the background and theory of mass media and then completes the program by selecting courses in the areas of media production and media application. The program is considered a strong complement to majors in a variety of fields given the impact of mass mediated messages on contemporary organizations and society in general.

**New England Conservatory
Affiliation**

According to a reciprocal agreement between Northeastern and the New England Conservatory, a limited number of qualified Arts and Sciences students may take courses at the New England Conservatory as part of the regular course load and tuition fee at Northeastern. This arrangement provides for Northeastern students who qualify the opportunity to enhance their cultural life by taking part in the richness of music education that is the hallmark of the Conservatory. Northeastern students who participate in this program, as well as any student who declares music as his or her major, are also given full library privileges to the Conservatory.

Students interested in this program should contact Professor Joshua Jacobson, Chairman of the Music Department at Northeastern, 437-2440, to make the appropriate arrangements.

**Personality and Social
Psychology Specialization**

The Departments of Psychology and Sociology/Anthropology have combined their resources to offer students a new interdisciplinary specialization that can be pursued for a degree in either of these academic departments.

The specialization in personality and social psychology offers students the opportunity to acquire a systematic understanding of various life processes, such as childrearing, aggression, anxiety, prejudice, attitude formation and change, moral development, and psychopathology. It includes studies of attraction and love, conformity, formation of identity, helping behavior, morality, and other related topics.

Students pursuing an interdisciplinary specialization take courses in both the Psychology and Sociology/Anthropology Departments. However, the student may select the department in which the specialization will be pursued.

In making this selection, the student should consider how each department differs in methods and level of analysis. These differences as well as various course offerings are outlined in a brochure titled *A New Specialization: Personality and Social Psychology*, which can be obtained by writing to the Department of

Psychology (234 Nightingale Hall) or the Department of Sociology/Anthropology (500 Holmes Hall). Also, prospective students should discuss their potential department affiliations with Professors Golden or Levin (Sociology/Anthropology) and Professors Harkins or Zamansky (Psychology).

This is an interdisciplinary program that is separate from the social psychology specialization outlined on page 79.

Russian Studies Minor

The Russian studies minor is an interdisciplinary program which provides students with an opportunity to develop a broad understanding of the Soviet Union and, secondarily, the Eastern Bloc countries. Through the study of language, literature, society, history, economy, culture, and behavior, students can become knowledgeable about the people of this enormous region. In addition, the minor may help to prepare students for graduate study or employment in areas such as government, teaching, journalism, and business.

School for Field Studies Affiliation

The College of Arts and Sciences is affiliated with the School for Field Studies (SFS), a nonprofit educational organization that offers one- and two-month field study expeditions throughout the world. Semester programs on wildlife management, in Athi Plains, Kenya, and on Coral Reef ecology, in St. John, U.S. Virgin Islands, are offered yearly. Programs combine applied academics with training in field research methods and teamwork—an exciting hands-on approach to science. Credit is granted for the coursework. Students of all levels and disciplines are eligible, but participation of Northeastern University students is limited proportionate to the total number of outside participants in the SFS program. Additional information may be obtained in the Arts and Sciences Dean's Office.

Teacher Preparation Option

Students in some majors have the option of preparing for secondary education teacher certification in Massachusetts simultaneously with graduation from the College. The College of Arts and Sciences, in conjunction with the Boston-Bouvé College of Human Development Professions, assists students interested in this option in taking the appropriate education courses and practice teaching necessary for certification.

Technical Communication Minor

Technical communication combines written, oral, and graphics skills with a background in science or technology. The minor in technical communication helps students prepare for careers as technical writers, or for careers in which technical communication is a significant part of their jobs. Students in English or other liberal arts studies may elect the minor, as may students from a variety of technological or scientific fields.

Trent Polytechnic Exchange Program

The Trent program presents an opportunity for upperclass Northeastern students to study theory and practice of social and human services in the United Kingdom. Students participate in an academic term at Trent Polytechnic in Nottingham, England, and an additional six-month cooperative experience in appropriate institutions and organizations.

Students study the development of contemporary British social structure, its institutions and strategies to deal with modern social problems. Their assignment to a specific institution offers a chance for firsthand observations of a particular social or human service.

Trent is the largest practitioner of cooperative education in the United Kingdom. Community Service Volunteers (CSV), an organization comparable to our VISTA, places students for the cooperative period. CSV is an educational charity which involves young people in full-time community service work throughout Great Britain (for example, diagnostic centers, schools for emotionally disturbed children, or social service departments in local communities).

These two organizations provide a unique and challenging program for Northeastern students who qualify academically. The program can accommodate twenty to thirty students. Interested students should contact the chairman of the Department of Sociology and Anthropology or visit the International Cooperative Education Office.

Urban Studies Minor

The urban studies minor offers courses with an urban orientation in four main areas: (1) urban problems and policies; (2) urban form and design; (3) African-American studies; and (4) urban humanities. The minor may be useful for the student who majors in one of the social sciences (history, economics, political science) as well as the student with a career orientation towards political science or business administration in urban areas. The minor presents the opportunity to study the approach of different disciplines to solve the same set of urban problems. Studying the viewpoints of artists, minorities, economists, and others, the student is given the chance to develop a broader perspective on the identity of urban areas. Students may contact a representative of any one of the participating departments or the Dean's Office for additional information.

Women's Studies Minor

Women's studies offers students the opportunity to broaden their knowledge and understanding of human experience by approaching various disciplines from a non-traditional perspective—that of women. In the courses offered as part of Northeastern University's interdisciplinary women's studies minor, students will examine traditional stereotypes and roles, learn about women's

contribution to our history and culture, and consider the changing situation of both men and women in the public/private arena of life. Dr. Debra Kaufman, Department of Sociology and Anthropology, may be contacted for further information.

Journals

Essays on Modern Music

Essays on Modern Music is an annual monograph series published by the League of Composers—International Society For Contemporary Music through the University's Division of Fine Arts. The monographs feature articles on topics in contemporary music. Essays are written by composers, new music scholars, and critics. Articles frequently cover specific composers, historical eras, and other topics of interest to both the general reader and music students and scholars.

New England Quarterly

The *New England Quarterly*, published without interruption since 1928, is America's leading historical review of New England life and letters. Each book-length issue presents major articles in the fields of literature, history, and culture; a special feature of brief memoranda and recently discovered documents; and a substantial book review section.

Romanticism Past and Present

Romanticism Past and Present presents articles and reviews of books dealing with a Romantic sense of the past. After changing its title from *Milton and the Romantics* in 1981, the journal shifted direction to make it responsive to a broadening conception of Romanticism and Romantic studies. Seeking to develop a comparative and interdisciplinary orientation, the journal brings interdisciplinary and international concerns to bear on the study of English Romantic literature.

The Scriblerian

The Scriblerian, founded in 1969, is published in the autumn and spring at the departments of English, Temple University, Philadelphia, Pennsylvania; Northeastern University, Boston, Massachusetts; and Goldsmith's College, University of London, Great Britain. Its Northeastern editor is Dr. Arthur T. Weitzman. A semiannual news journal devoted to research on Dryden, Pope, Swift, and the Augustan Age in English literature.

Journal of Sport and Social Issues and ARENA Review

The *Journal of Sport and Social Issues* and the *ARENA Review*, both published through the Center for the Study of Sport in Society, are two scholarly publications dedicated to the study of sport and society. The *Journal of Sport and Social Issues* carries scholarly articles and book reviews on a wide range of topics. The *ARENA Review* is thematic, each issue focusing on a specific topic in sports.

Studies in American Fiction

Studies in American Fiction presents articles, notes, and reviews on all aspects of prose fiction of the United States. Readership and contributors represent an international community of scholars of American literature. The journal's broad professional purpose is to publish new discoveries, new documents, and new interpretations of important works of American fiction. The publication of Volume 13 in 1985 marked thirteen years of Northeastern's sponsorship of *Studies in American Fiction*, the first scholarly journal to be published at the University.

General Regulations for the College of Arts and Sciences

Students should note that this publication broadly defines the general regulations of the College. For more specific details students should consult the *College of Arts and Sciences Student Guidebook* and the *Core Curriculum Guidebook*, as well as other University publications such as the *Student Handbook* and the *Basic Day College Course Descriptions and Curriculum Guide*.

Graduation Requirements

Quantitative

Candidates for either the bachelor of arts or bachelor of science degree must successfully complete 176 quarter hours of credit, of which 32 quarter hours may be taken outside the College of Arts and Sciences (i.e., in colleges of business, engineering, etc.). In addition, only 4 quarter hours of physical education credits and no ROTC credits may be used to meet degree requirements.

Residency

Candidates must complete either 75 percent of the degree credit at Northeastern or the last three full quarters (a minimum of twelve full courses) at Northeastern.

Qualitative

Candidates must achieve a minimum cumulative average of 2.0 (grade of C).

Transfer Credit

Transfer credit from other colleges or universities is only granted initially for Arts and Sciences courses comparable to courses given at Northeastern. Students may petition for additional transfer credit in such areas as business, engineering, nursing, etc., in the first quarter in residence. Up to thirty-two credits of such non-Arts and Sciences courses may be granted. No transfer credit will be granted for courses in which the student received lower than a C (2.0) grade.

Freshman English

All degree candidates must complete one quarter of Freshman Composition and one quarter of Introduction to Literature. Normally, this will be done by completing courses ENG 1110 and ENG 1111 at Northeastern. Students who need extra assistance in writing skills, however, normally take three quarters of Freshman English.

Middler-Year Writing Requirement

All students who entered during or after the fall of 1985 must fulfill an upper division writing proficiency requirement. This is normally done at the point at which the student has successfully completed eighty quarter hours (the middler year for co-op students or the junior year for non co-op students). There are several options available to students fulfilling this requirement.

Major

Candidates must complete successfully the courses specified as major requirements. A complete listing of these required courses is published in the *Basic Day College Course Descriptions and Curriculum Guide*.

Core Curriculum

All Arts and Sciences students must complete several "core requirements" for graduation. The Core Curriculum requires that courses be taken in the following areas: basic skills, both communicative and quantitative; methods of inquiry; alternative cultures and societies; Western cultural heritage; theoretical perspectives and changes; and current issues in perspective. Full details on the Core Curriculum are provided to students at entry, and are also available from academic advisers in the Dean's Office. There is a *Core Curriculum Guidebook* available in the Dean's Office which describes the requirements in full detail.

Foreign Language

All candidates for the Bachelor of Arts degree must attain a level of proficiency in a modern foreign language indicated by passing grades in intermediate-level II of a college course or by meeting a comparable criterion that has been approved by the Modern Languages Department.

A *conditional exemption* from this requirement may be granted in the following situations:

1. students who earned an average grade of C or better in a full, four-year language sequence in secondary school
2. students who earned an average grade of A in a three-year language sequence in secondary school.

A conditional exemption *must* be confirmed by taking a proficiency examination during the first quarter at the University. A sufficiently high score will verify the exemption; otherwise the student will be advised of the appropriate language course to take in the following quarter.

An *absolute exemption* will be granted to students:

1. for whom English is a foreign language
2. who receive a score of 550 or better in the Language Achievement Examinations.

For students who have not met the foreign language requirement at the time of entrance, the entry level into foreign language study depends upon the scope and level of prior study. The normal sequence for students with no prior preparation is two quarters of elementary-level language and two quarters of intermediate-level language. The Modern Languages Department will determine an appropriate entry point at which students who have partial language preparation may begin completing the requirement.

Graduation with Honors

Candidates who have achieved superior grades in their academic work will be graduated with honors. Upon special vote of the faculty, a limited number of this group may be graduated with high honors or with highest honors. Students must have been in attendance at the University for at least six academic quarters before they become eligible for honors at graduation.

Commencement Exercises

The College of Arts and Sciences holds commencement exercises each June and September.



Boston-Bouvé College of Human Development Professions

Paul M. Lepley, Ed.D., *Dean*

Humberto F. Goncalves, B.S., *Associate Dean of Administration and Planning*

Arlene T. Greenstein, Ph.D., *Associate Dean for Academic Affairs*

Janice Walker, A.B., *Assistant Dean and Director of the Graduate School*

Boston-Bouvé College of Human Development Professions provides students the opportunity to become accomplished practitioners in the human development professions. Typically, these students share a commitment to improve the quality of life for people who will seek their services in community, recreational, clinical, or educational settings. The primary goal of the College is to provide the high-quality instruction, guidance, and practical experience essential for the development of dedicated, self-reliant professionals. Undergraduate majors are offered in the Human Services Program and in three departments: Education; Health, Sport, and Leisure Studies; and Physical Therapy.

Boston-Bouvé College offers students the individual attention and encouragement only available in a small college within a large university. College facilities, clubs, and student events are supplemented and enhanced by the resources of Northeastern University and the metropolitan Boston area.

The Five-Year Program

In the freshman year students receive a grounding in the liberal arts and sciences and an orientation to their chosen profession. In their sophomore year, students are introduced to specific competencies that are developed and expanded throughout the program. In the junior and senior years professional theory and practices are emphasized, and all students have the opportunity to synthesize knowledge and skills through supervised experiences in clinical practice, student teaching, field experience or internship. In addition, beginning in the sophomore year, each curriculum is enriched by cooperative education work experiences for two of the four quarters in an academic year. Co-op jobs afford each student the valuable opportunity to develop work skills related to the helping professions, usually within their area of specialization. Cooperative education is an integral part of all programs offered in the College.

Honors Program

The Boston-Bouvé College of Human Development Professions participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

Facilities

The facilities of the College are diverse and include classrooms; faculty and administrative offices; areas for research, professional endeavors; and extracurricular activities. Dockser Hall houses a gymnasium, dance studio, computer rooms, exercise physiology laboratory, locker and shower facilities, and a motor learning laboratory. The swimming pool, weight room, handball/raquetball courts, and locker and shower facilities are located in Barletta Natatorium. Cabot Building includes a large gymnasium; gymnastics, wrestling, exercise and weight training facilities in addition to an athletic training laboratory, indoor track, and locker rooms.

The Department of Education oversees the Reading Clinic which provides corrective instruction for area school children and clinical experience for education students. Similarly, the Russell J. Call Children's Center provides day care for children from two years nine months to five years and a laboratory setting for education majors. Children's literature and related learning resource materials are housed in the F. André Favat Center.

The remodeled and expanded facilities of the Physical Therapy Department are located in Mary Gass Robinson Hall. The Lupean Professional Library maintains an up-to-date collection of physical therapy and medical books and periodicals which supplement the University library. The new Human Gross Anatomy Laboratory, three classroom laboratories, and two research laboratories are designed and equipped specifically for the practice of clinical procedures and research.

The Speech-Language and Hearing Clinic in the Forsyth Building serves clients ranging from toddlers to the elderly. Diagnostic evaluations and treatment are provided to clients who demonstrate a variety of communication disorders. Students may also engage in academic research in communication disorders. The Communications Research Laboratory makes available an array of up-to-date equipment and computer technology to aid students in generating, analyzing, and compiling the results of their work.

The Warren Center serves as a practical laboratory as well as a recreation center for the College. Its athletic fields, tennis courts, ropes course, cross-country ski trails, winterized cottages, and Hayden Lodge provide year round opportunities for outdoor learning twenty-five miles from the Boston campus. Freshman orientation, courses, seminars, and workshops are conducted at the center throughout the year.

**Admission
Fieldwork, Student Teaching,
Clinical Practicums, and
Internships**

Each major area of study requires satisfactory completion of specified prerequisites before assignment to fieldwork, student teaching, clinical practicum or internship. In the third year, before the first supervised clinical education experience, physical therapy students must be examined by physicians in the University Health Services, at a moderate fee, or by a personal physician. Students

majoring in programs offered by the Department of Education and the Department of Health, Sport, and Leisure Studies must present evidence that they are free of tuberculosis before engaging in student teaching.

Graduation Requirements**Degrees**

Students in the early childhood education, elementary education, English as a second language, athletic training, dance education teacher preparation, cardiovascular health and exercise, human services, community health education, physical education teacher preparation, and school health education programs earn the degree of Bachelor of Science in Education; those in the recreation management and therapeutic recreation program specializations are awarded the Bachelor of Science in Recreation and Leisure Studies degree; and students graduating in physical therapy receive the degree of Bachelor of Science in Physical Therapy. These degrees are awarded to qualified candidates who have completed the prescribed curricula. Student teaching, field experience, or clinical practice is an integral part of the curriculum and is required for graduation. All majors require demonstration of computer literacy and satisfactory completion of the Middler-Year Writing Requirement, in addition to the other University requirements, prior to graduation.

Qualifications**Quantitative**

The quarter hours required in each curriculum differ.

Education

Early Childhood Education 177

Elementary Education 180

English as a Second Language 181

Physical Education

Athletic Training Teacher Preparation 184

Athletic Training/Cardiovascular Health and Exercise 186

Cardiovascular Health and Exercise 177

Dance Education Teacher Preparation 180

Physical Education Teacher Preparation 180

Recreation and Leisure Studies

Recreation Management 172

Therapeutic Recreation 172

School and Community Health

School Health Education 178

School Health Education/Athletic Training 178

Community Health Education 178

Community Health Education/Cardiovascular Health and Exercise 185

<i>Physical Therapy</i>	
Physical Therapy	180
<i>Human Services</i>	
Human Services	176

Students must satisfy the requirements of the Department of Cooperative Education to become eligible for their degrees.

Senior-year course work and required experiences must be completed in full-time residence at Northeastern University or in an educational setting approved by the College.

Qualitative

The overall cumulative quality-point averages required to enter each class level are explicitly stated in the *Student Handbook*. Throughout the professional sequence, students must maintain required averages and must demonstrate a high level of personal and professional maturity to continue field practice and be approved for graduation. Because of accreditation recommendations and differences in curricula, variations in qualitative requirements may occur.

Transfer students in any curriculum may be accepted into the College at upperclass levels except in physical therapy, if there are available spaces. Each transcript is individually assessed for qualification, placement, and program design.

Graduation with Honor

Candidates who have attained superior grades in their academic work will be graduated cum laude. Upon special vote of the faculty, a number of this group may be graduated magna cum laude or summa cum laude. Students must have been in full time attendance at the University for at least six quarters before they become eligible for honors at graduation.

Program Accreditation

The curriculum in physical therapy is accredited by the American Physical Therapy Association. Programs in early childhood education, elementary education, school health education, and physical education are state-approved under the Interstate Certification Compact (I.C.C.).

Licensure/Registration

All fifty states have laws governing the practice of physical therapy. In order to be eligible for employment to practice physical therapy, graduates must meet the specific legal requirements of the state in which they wish to work. In most states the requirements include graduation from an accredited school of physical therapy and a satisfactory grade on a written examination. Graduates are responsible for determining what the specific legal requirements are to practice in the state in which they seek employment.

Certification

Upon successful completion of the programs in early childhood education, elementary education, school health education, and physical education, students are eligible to apply for certification by the Commonwealth of Massachusetts. Certification is required for public school teaching, but does not guarantee a position. Reciprocal certification is available in many states of the United States, for those who complete I.C.C. approved programs. Graduates are responsible for determining the requirements of the states in which they are interested.

Department of Education

Paul H. Tedesco, Ph.D., *Professor and Chairman*

Professors

Vaughn Guloyan, Ed.D.
John D. Herzog, Ph.D.
Melvin Howards, Ph.D.
Mervin D. Lynch, Ph.D.
Sandra M. Parker, Ed.D.

Assistant Professors

Thomas H. Clark, M.A.
Carlton B. Lehmkuhl, Ph.D.
John F. Maguire, M.Ed.

Associate Professors

Nicholas J. Buffone, Ph.D.
Leslie A. Burg, Ed.D.
Mary J. Lee, M.Ed.
Joseph Meier, Ed.D.
Irene A. Nichols, Ed.D.
Barbara A. Schram, Ed.D.

Degree Offered: Bachelor of Science in Education

The Department of Education offers basic and advanced courses in the humanities and behavioral sciences for students in education, human services, and other human development professions. The aims of these courses are to promote understanding of the processes of intentional socialization and deliberate intervention in people's lives and to familiarize students with the body of knowledge dealing with the principles of human development and well-being.

The courses are open to all students in the University provided they can meet the prerequisites listed in the *Basic Day Colleges Course Descriptions and Curriculum Guide*.

Education and Social Science
Human Development and Learning I
Human Development and Learning II
Creative Expression in Children

Educational Applications of Social Psychology
 Mental Health in Teaching
 Cross-Cultural Studies of Child Rearing and Education
 Language and Cognition: Educational Implications
 Seminar in Adolescent Psychology
 Seminar in Human Learning and Motivation
 Seminar in Early Childhood Development
 Measurement and Evaluation
 Introduction to Educational Statistics
 Comparative Education
 Philosophy of Education
 Current Issues in American Education
 Seminar in Group Process
 Day-Care and Nursery Schools: Social and Cultural Origins
 Schools as Social Systems
 Class and Ethnic Relations in Education
 Beginning Computer Use
 The Human Services Professions
 Educational and Psychosocial Development
 Directed Study

The Department of Education also provides teacher preparation programs in a variety of fields and levels. To assist students enrolled in these programs, the department utilizes three support units: the Reading Clinic, the F. André Favat Learning Resources Center, and the Russell J. Call Children's Center.

The aim of the department is to make it possible for students to gain certification in a teaching major and/or level and to acquire the competencies necessary for success in teaching.

Teacher Preparation: Five-Year Cooperative Education Program

Early Childhood Education (K-3)*

Students majoring in early childhood education pursue studies in the College of Arts and Sciences and in other Basic Colleges of the University, as well as in Boston-Bouvé College. This broad academic background, combined with experiences in cooperative education, permits the development of a cohesive professional base. The Russell J. Call Children's Center provides experiences in fieldwork for students in the early childhood education program. Pre-student teaching experiences in appropriate field settings are an integral part of several required courses.

Elementary Education (Grades 1-6)*

Elementary education majors acquire a broad academic base by enrolling in courses provided by various colleges of the University. Acquiring the necessary teaching competencies is the result of the course experiences, the work experiences in the Cooperative Plan

* The early childhood and elementary education programs are designed to meet requirements for certification in the Commonwealth of Massachusetts and in certain other states. Details may be obtained from the department chairman. All major programs cited above prepare students for initial certification in Massachusetts.

of Education, and the pre-student teaching field activities. In addition to courses required of all elementary education majors, students choose an area of emphasis from the following: humanities, reading language, science and mathematics, or social sciences.

Emphases usually consist of forty quarter hours. Each emphasis has been designed to help focus the studies, but does not lead to certification in that specific area. It may, however, serve as a catalyst for further study in a graduate program.

Special Education Minor

Students majoring in elementary education may complete a minor in special education which will permit them to apply for certification to teach children with moderate special needs in the Commonwealth of Massachusetts.

Secondary Education (Grades 9–12)

Majors in preparation to teach biology, chemistry, earth science, English, French, history, mathematics, physics, or Spanish in the schools of Massachusetts are provided for students in the College of Arts and Sciences in those respective fields. Additionally, students majoring in economics, philosophy, political science, or sociology may pursue state certification in the teaching of social studies. Specified competencies established for certification in Massachusetts may be acquired through cooperative education experiences, designated courses, and a quarter of full-time student teaching, arranged by the University's Department of Education.

English as a Second Language

The English as a second language major provides preparation for teaching at the elementary, secondary, and adult levels in the United States and abroad. The program includes courses in foreign language, English, cultural and cross-cultural studies, methods and materials for teaching English, and international aspects of teaching and learning. This broad academic background combined with practical experiences in cooperative education, offers a strong professional foundation for those interested in this teaching specialization.

Student Teaching

Student teaching is a full-time experience for a complete academic quarter during the senior year. It follows planned experiences that are designed to help the student toward a rewarding quarter of student teaching. A University professor and a cooperating classroom teacher have shared responsibility in the supervision of each student teacher.

Teacher Certification

Inasmuch as public education is a state responsibility, each state prescribes the conditions under which persons may be licensed to teach in its public schools. The requirements for obtaining a certificate for teaching, therefore, vary among the different states.

**Services Offered by the
Department of Education**

The F. André Favat Center

The center houses an extensive library of children's literature, books, journals, tests, and other materials designed primarily to support academic programs of the Boston-Bouvé College of Human Development Professions, but is open to all University students.

The Reading Clinic

See page 312.

Speed Reading

See page 312.

**Department of Health, Sport, and
Leisure Studies**

Carl S. Christensen, Ph.D., *Professor and Chairman*

Professors

Peter J. Graham, Ed.D.
Richard C. Zobel, Ed.D.

Associate Professors

Robert S. Curtin, Ed.D.
Elaine G. Eliopoulos, Ed.D.
William J. Gillespie, Ed.D.
Dorett M. Hope, Ed.D.
Kerkor Kassabian, M.Ed.
Richard B. Morrison, Ed.D.
Mary P. Nicholson, M.S.
Judith A. Noblitt, M.Ed.
Frank M. Robinson, M.Ed.,
C.A.G.S.

Assistant Professors

George R. Atkinson, Ed.D.
Glenn A. Boden, M.Ed.
Marilyn A. Cairns, Sc.D.
Patricia M. Fetter, Ph.D.
Lynn M. Waishwell, Ph.D.
Linda B. Zaichowsky, Ph.D.

Instructors

Janet E. Guilfoyle, M.S.
George B. Ransom, Ed.D.

Lecturers

Cornelia B. McCaskill, M.A.
Colleen Fritze, M.S.

Degrees Offered: Bachelor of Science in Education, Bachelor of Science in Recreation and Leisure Studies

The department provides program specializations and services, conducts research, and disseminates knowledge concerned with improving the quality of life with respect to health, sport, and leisure. Faculty are committed to pre- and in-service preparation of practitioners to serve people of all ages and also to the scholarly investigation related to the eight program specializations offered by the department.

The Five-Year Cooperative Education Programs	<p>Within its three majors (physical education, recreation and leisure studies, and school and community health education) the department offers program specializations in eight areas: athletic training, cardiovascular health and exercise, community health education, dance education teacher preparation, physical education teacher preparation, recreation management, school health education, and therapeutic recreation. With appropriate use of electives, students may combine certain majors. For example: athletic training/cardiovascular health and exercise, athletic training/physical education teacher certification, school health education/athletic training, community health education/cardiovascular health and exercise.</p> <p>All students within this department are expected to maintain a specific grade point average at each class level (see the current <i>Student Handbook for the Basic Colleges</i>). Fees may be assessed in courses requiring highly specialized equipment, supplies, or off-campus facilities.</p>
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Admissions Requirements	<p>Students desiring admission to degree programs must meet the entrance requirements of the University. In addition to transcripts showing successful completion of a secondary school college preparatory program, applicants must submit scores from the Scholastic Aptitude Test (SAT) and three College Board Achievement Tests, preferably in areas related to their intended fields of study. Although not required, a personal interview with an admissions counselor is recommended.</p>
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Physical Education/Athletic Training

Degree Offered: Bachelor of Science in Education

Professional Preparation	<p>The athletic trainer plays an important role not just in professional sports, but also in the organized and recreational activities of sportsmen and women from all walks of life.</p> <p>A necessary link between the athlete, the coach, and the physician, the athletic trainer provides important services in preventing, treating, and rehabilitating sports injuries. The trainer's duties include advising on proper conditioning techniques to help reduce injury, assessing the severity of injuries that do occur and administering basic first aid, and supervising post-injury rehabilitation programs.</p> <p>In general, athletic trainers work in organized sports—either for secondary school or college athletic teams or for professional teams engaged in a variety of sports.</p>
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The Five-Year Cooperative Education Program	<p>This five-year Bachelor of Science in Education program specialization is designed specifically for students interested in careers as athletic trainers. The athletic training program specialization may</p>
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be combined with the cardiovascular health and exercise, health, or physical education teacher preparation programs. These combinations of study may be especially valuable since, for example, many schools hire one person to be both physical education or health education teacher and athletic trainer.

Students interested in the athletic training program specialization must be accepted into Northeastern's Health, Sport, and Leisure Studies Department (see Admission requirements).

At the completion of their first year of study, they may petition for acceptance into the athletic training program specialization. To be accepted, students must have earned at least a 1.85 quality-point average during their first year. They must continue to meet specified requirements to remain in the program.

Certification	Those who have completed the athletic training specialization combined with the physical education teacher preparation curriculum are eligible to apply to the National Athletic Trainers Association to take the certification examination and are eligible to apply for certification as teachers of physical education under I.C.C. approval. Certification in physical education and/or athletic training does not guarantee a position in either profession.
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Accreditation	The professional program specialization in athletic training is accredited by the National Athletic Trainers Association.
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Basic Course Requirements

I. General Requirements for Freshmen (Year One)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English I and II	8	Issues in Health	4
Biology I	4	Group Dynamics	3
Chemistry I	5	Life/Career Planning	3
Mathematics	4	History/Philosophy of Physical Education	3
Social Science I	4	Swimming	1
Human Movement	3	Physical Conditioning	1
Human Development	4	Gymnastics I and II	2
Basketball	1	First Aid	2
Track and Field	1		

II. Upperclass Requirements (Years Two–Five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Anatomy/Physiology I and II	8	Secondary School Activities	3
Computer Use	4	Therapeutic Modalities	4
Motor Development	4	Tennis	1
Human Development II	4	Weight Training	1
Physics	4	Kinesiology	4
Basic Athletic Training	3	Statistics	4
Basic Athletic Training Lab	1	Badminton	1
Critical Teaching Skills	4	Foundations of Psychology	4
Clinical Athletic Training	2	Middle-Year Writing Requirement	4
Measurement and Evaluation	4	Therapeutic Reconditioning	4
2 Teaching, Analysis, and Coaching Courses	4	Motor Learning	4
Exercise Physiology	4	Curriculum Development	3
Advanced Athletic Training	4	Theory of Coaching	2
Physical Conditioning Programming	2	Nutrition	4
3 electives	12	Volleyball	1
Senior Seminar	4	Psychology of Sport	2
Physical Education Skill elective	1	Overview of Disabilities	4
		Supervised Student Teaching	6
		Athletic Training Internship	6

Graduation requirement–athletic training/cardiovascular health and exercise–186 quarter hours

Graduation requirement–athletic training teacher preparation–184 quarter hours

Physical Education/Cardiovascular Health and Exercise

Degree Offered: Bachelor of Science in Education

Professional Preparation

Students interested in careers as preventive/rehabilitative exercise technologists and specialists or health and fitness counselors in private and public agencies, commercial health and fitness centers, hospitals and out-patient clinics, or business and corporations may obtain a bachelor of science degree in the program specialization of cardiovascular health and exercise.

The Five-Year Cooperative Education Program

The program specialization in cardiovascular health and exercise is focused on the health and exercise sciences as they relate to physical fitness, health promotion, and primary and secondary prevention of cardiovascular disease. In addition to the applied science base, students also take courses designed to help them acquire the knowledge and skills necessary for physical and health assessment, exercise prescription, and program development and supervision for adults in preventive and rehabilitative health and exercise programs.

Certification

Successful completion of the program specialization prepares the student to apply for certification as a preventive/rehabilitative exercise technologist or specialist granted by the American College of Sports Medicine.

Basic Course Requirements

I. General Requirements for Freshmen (Year One)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Biology I and II	8	Mathematics	4
English I and II	8	Current Health Issues	4
Human Development I and II	8	First Aid I	2
Social Science	4	Guided Skills Electives	3
Human Movement	3	Swimming	1
Life/Career Planning	3	Physical Conditioning	1

II. Upperclass Requirements (Years Two–Five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Anatomy/Physiology I and II	8	Measurement and Evaluation	4
Motor Development	4	Exercise Physiology	4
Chemistry I and II	10	Commercial Recreation Marketing	4
Basic Athletic Training	3	Budget Analysis	4
Basic Athletic Training Lab	1	Exercise Testing Prescription	3
Computer Use	4	Weight Training	1
Psychology I	4	Electrocardiography	4
Communicable/Degenerative Diseases	4	Physical Conditioning Programming	2
Health Counseling	4	Nutrition	4
Electives	20	Middler-Year Writing Requirement	4
Community Health	4	Supervised Field Experience	12
Special Problems	4		
Kinesiology	4		
Statistics	4		
Introduction to Counseling	4		

Minimum graduation requirement–177 quarter hours

Physical Education/Dance Education Teacher Preparation

Degree Offered: Bachelor of Science in Education

Professional Preparation

Graduates who complete the program specialization in dance education often find employment not only in public and private schools, but also in dance studios, community recreation agencies, and in some cases with dance companies. Students wishing to pursue advanced academic study may apply for admission to dance related graduate programs.

The Five-Year Cooperative Education Program

Students in this specialization complete 180 quarter hours of course work of which 61 are in dance. The dance offerings at Northeastern University are supplemented and enriched by a continuing program of professional dance residencies conducted on campus. Activities range from dance workshops, lecture-demonstrations, and master classes to fully-staged professional performances.

Certification

Students who successfully complete the dance program specialization are eligible for Massachusetts certification as a teacher of dance.

Basic Course Requirements

I. General Requirements for Freshmen (Year One)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English I and II	8	Improvisation	1
Social Science	4	Human Development	4
Introduction to Theatre		Life/Career Planning	3
Arts	4	Mathematics	4
Aspects of Dance	3	First Aid	2
Group Dynamics	3	Modern Dance I and II	2
Electives	8	Jazz Dance I	1
Ballet I	1	Movement Fundamentals	1

II. Upperclass Requirements (Years Two–Five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Anatomy/Physiology I	4	Dance in Culture	4
Creative Dance for Elementary or Secondary School*	2	Human Development II	4
Dance Composition I	3	Dance Composition II	3
Rhythmic Analysis	1	Directed Teaching II	1
Ballet II	1	Modern Dance III	1
Jazz Dance II	1	Ballet III	1
Kinesiology	4	Modern Dance IV	1
Foundations of Psychology	4	Folk and Square Dance	1
Critical Teaching Skills*	4	Motor Learning	4
Laban Movement Analysis	2	Measurement and Evaluation	4
Rehearsal and Performance	1	Jazz Dance III	1
Overview of Disabilities	4	Curriculum Development	3
Basic Athletic Training	3	Teaching Folk, Square, and Ballroom Dance*	3
Dance in 20th Century	4	Special Problems	3
Directed Teaching I	1	Electives	32
Ballroom Dance	1	Middler-Year Writing Requirement	4
Dance Technique Electives	2	Student Teaching	12
Computer Use	4		
Motor Development	4		

Minimum graduation requirement—180 quarter hours

* Indicates a pre-practicum course with field experience.

Note: The above program specialization is designed to assist the student to prepare for either secondary (5–12) or elementary (K–9) school dance teacher certification.

Physical Education/Teacher Preparation

Degree Offered: Bachelor of Science in Education

Professional Preparation

Students in physical education have the opportunity to prepare themselves as professionals capable of developing the materials and methods appropriate to teaching physical education in public and private elementary or secondary schools.

Graduates may qualify as athletic coaches, supervisors of physical education, or leaders in YMCAs, YWCAs, health clubs, other youth organizations, or as exercise teachers in industry and business.

The Five-Year Cooperative Education Program	In addition to a strong background in general education, applied science, and pedagogy, each student in the physical education/teacher certification preparation program is expected to demonstrate a competent level of knowledge and proficiency in physical skills courses such as swimming, gymnastics, track, badminton, tennis, volleyball, and basketball. Skill may be demonstrated through competency testing or by taking the appropriate courses. Major students are assigned supervised student teaching or field experiences in schools or agencies throughout the Greater Boston area as appropriate to their areas of concentration. In addition, students have the opportunity to increase their experience with children or adults through cooperative work assignments and in pre-practicum courses.
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Accreditation	The professional teacher education program in physical education is approved under the Interstate Certification Compact (I.C.C.).
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Certification	Upon successful completion of the physical education requirements for graduation, students are eligible to apply for certification to teach in the Commonwealth of Massachusetts schools. Certification in physical education does not guarantee a teaching position.
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Basic Course Requirements

I. General Requirements for Freshmen (Year One)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Biology I	4	Biology II, Chemistry I or	
English I and II	8	Physics	4
Human Movement	3	Social Science	4
Physical Conditioning	1	Swimming	1
Gymnastics I and II	2	Life/Career Planning	3
Human Development I	4	Basketball	1
Health Issues	4	Mathematics	4
First Aid	2	Group Dynamics	3
Track and Field	1	History and Philosophy of	
		Physical Education	3

II. Upperclass Requirements (Years Two–Five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Anatomy/Physiology	8	Computer Use	4
Motor Development	4	Human Development II	4
Elementary School Activities* or	4	Tennis	1
Secondary School Activities*	3	Kinesiology	4
Statistics	4	Teaching, Analysis, and Coaching Courses	8
Critical Teaching Skills*	4	Curriculum Development	3
Exercise Physiology	4	Theory of Coaching/Play	2
Overview of Disabilities*	4	Volleyball	1
Basic Athletic Training	3	Supervised Student Teaching	12
Administration of Physical Education	4	Electives	30
Activity Skill electives	4	Badminton	1
Measurement and Evaluation	4	Foundations of Psychology	4
Motor Learning	4	Middler-Year Writing Requirement	4

Minimum graduation requirement—180 quarter hours

* Indicates a pre-practicum course with field experience.

Note: The physical education program specialization is designed to assist the student in preparing for either secondary or elementary school physical education teacher certification. The curriculum may be altered because of changes in state certification regulations.

Recreation and Leisure Studies/ Recreation Management

Degree Offered: Bachelor of Science in Recreation and Leisure Studies

Professional Preparation

The academic and work experiences in recreation management are designed to help the student to develop those skills most necessary to obtain entry level management positions in commercial, government, and nonprofit recreation. Students wishing to continue their education appropriately seek admission to master's of business administration (M.B.A.) or master's of public administration (M.P.A.) degree programs.

The Five-Year Program Cooperative Education Program

Students in the recreation management specialization have academic and work experiences which combine to give them an opportunity to develop a strong general education and marketable job skills.

The academic work emphasizes the behavioral sciences as they apply in leisure and managerial settings. During the freshman year, students take an intensive, in-residence program in leadership and human relations at the University's Warren Center, twenty-five miles west of Boston.

Equally heavy emphasis is placed on developing a working knowledge of marketing, budgeting, planning, evaluation, and computer applications as they apply to the leisure industry. The case method of teaching is widely used to help students identify and solve practical problems facing recreation organizations in the commercial and nonprofit sectors.

The Cooperative Education Plan provides opportunities for professional work experiences in health clubs, racquet clubs, resorts, tourism agencies, government, and nonprofit agencies.

Basic Course Requirements

I. General Requirements for Freshmen (Year One)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Biology I and II	8	Speech Fundamentals	3
English I and II	8	Foundations of Leadership and Leisure Services	4
Social Science	4	Computer Use	4
Life/Career Planning	4	Education elective	4
Health Issues	4	Professional Skills	4
Leisure Awareness	2		

II. Upperclass Requirements (Years Two–Five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Human Development I and II	8	Guided electives	28
Anatomy/Physiology I and II	8	Research Methods	4
Introduction to Recreation and Leisure Services	3	Science Electives	8
Research Applications	4	Budget Analysis	4
Program Planning	4	Elements of Outdoor Recreation Planning	4
Commercial Recreation Marketing	4	Group Dynamics	3
Internship Seminar	1	Administration of Recreation and Parks	4
Internship in Recreation Management	12	Program Evaluation	4
Senior Seminar	4	Program electives	12
		Middler-Year Writing Requirement	4

Minimum graduation requirement—172 quarter hours

Recreation and Leisure Studies/ Therapeutic Recreation

Degree Offered: Bachelor of Science in Recreation and Leisure Studies

Professional Preparation

The unique problems of special needs groups in our society have recently become the focus of intense study. As our understanding of their needs increases, so too does our appreciation of the thera-

peutic values associated with participation in recreation activities. Such advances in knowledge have helped establish further career opportunities for students interested in recreation and leisure studies.

Therapeutic recreation specialists may be members of health care teams in clinical and residential treatment centers, or they may serve as advocates for disabled persons who live in the community and wish to pursue leisure activities independently.

The Five-Year Cooperative Education Program

Therapeutic recreation students take courses in behavioral and social sciences, counseling techniques, and program planning for various special needs populations. The therapeutic recreation program specialization is designed to help equip students with the professional job skills that are essential to work with disabled people in institutions and community-based settings, including hospitals, rehabilitation facilities, nursing homes, schools, and residential centers as well as day-care vocational/avocational centers in therapy collaboratives. A variety of experiential education opportunities supplementing regular course offerings are available through ECHO, Inc , (a private camp affiliated with Northeastern University serving disabled children and their nondisabled peers).

Basic Course Requirements

I. General Requirements for Freshmen (Year One)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Biology I and II	8	Speech Fundamentals	3
English I and II	8	Foundations of Leadership and Leisure Services	4
Social Science	4	Computer Use	4
Life/Career Planning	4	Education elective	4
Health Issues	4	Professional Skills	4
Leisure Awareness	2		

II. Upperclass Requirements (Years Two–Five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Human Development I and II	8	Research Methods	4
Anatomy/Physiology I and II	8	Leisure Counseling	4
Science electives	8	Research Applications	4
Introduction to Recreation and Leisure Services	3	Program Planning	4
Internship Seminar	1	Group Dynamics	3
Internship	12	Overview of Physical Disabilities	4
Senior Seminar	4	Social and Psychological Impacts of Disabilities	4
Guided electives	32	Program electives	12
Foundations of Psychiatric Services	4	Middler-Year Writing Requirement	4

Minimum graduation requirement—172 quarter hours

Note: Students are scheduled for a one-week resident camp experience during the freshman year at the Warren Center in Ashland, approximately twenty-five miles west of the Boston Campus. Lab fee is required.

School and Community Health Education

Degree Offered: Bachelor of Science in Education

Professional Preparation

Health Education is a relatively new profession concerned with improving individual and community health through educational activities. While working in such settings as volunteer health agencies, public health clinics, elementary and secondary schools, or health-planning organizations, the health educator facilitates behavior change as a means to enriching the quality of life. The health educator uses techniques and information from both medical and educational fields in order to assist individuals and communities dealing with the emotional, physical, or social aspects of health.

**The Five-Year Cooperative
Education Program**

Since health has psychological, physical, and social components, the major is organized to help students develop an understanding of each of these, as well as their interaction. Courses during the first part of the program emphasize the foundations of health education in the social and life sciences. Practical experience in health education is included throughout the program including cooperative work experiences to provide the student with an opportunity to apply theory and techniques with Boston area groups. Major courses on contemporary health issues help prepare the student to understand the details and complexities of several important health topics. Educational issues and approaches are included in courses to help students understand the role of education in improving health both in schools and in the general community.

This program of study is intended to produce graduates with the competence to assess the health education needs of groups and to develop, organize, and evaluate effective educational activities. Throughout the program of study, the concepts of prevention, health promotion, wellness, and holistic health serve as common threads in professional preparation. The development of specific competencies for health education roles is an objective of the program within which there is the opportunity to specialize in school health education or community health education. Professional preparation in school health education varies from community health education in the application of fieldwork or internship experiences. The former applies fieldwork in public or private school settings while the latter applies fieldwork to other private or public agencies such as clinics, hospitals, or state and local health departments. Students selecting an emphasis in school health education must meet state certification requirements for field experiences in pre-practica and the practicum in a secondary school setting (grades 5–12).

Certification School Health Education

Upon successful completion of the requirements for graduation in school health education, students are eligible to apply for certification to teach in the Commonwealth of Massachusetts. There are no certification criteria for students in community health education. However, all students must satisfy departmental requirements before being approved for graduation.

Accreditation

The professional program specialization in school health education is accredited by the Interstate Certification Compact.

Basic Course Requirements

I. General Requirements for Freshmen (Year One)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Chemistry I and II	8	First Aid	2
Biology I and II	8	Social Science II	4
English I and II	8	Foundations of Health	2
Social Science I	4	Introduction to Safety	2
Health Issues	4	Instructional Resources	2
Mathematics	4	Computer Use	4
Physical Education activity elective skill	1		

II. Upperclass Requirements (Years Two–Five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Psychology I and II	8	Microbiology	4
Human Development I and II	8	Analysis of Instruction*	4
Anatomy/Physiology I and II	8	Mental Health	4
Health Concerns of Youth*	4	Introduction to Special Education	4
Measurement and Evaluation	4	Teaching Procedures/Curriculum in School/Community Health*	4
Drug Use/Abuse	4	Human Sexuality	4
Communicable/Degenerative Disease	4	Organization/Administration of Health Education	4
Longevity and Aging	4	Health Counseling	4
Community Health	4	Practicum	12
Seminar I and II	4	Physical Education activity electives	1
Education electives	4	Middler-Year Writing Requirement	4
General Studies electives	16		
Nutrition	4		

Minimum graduation requirement–178 quarter hours

* A pre-practicum course with field experience.

Students selecting an emphasis in school health education must meet state certification requirements for field experiences in pre-practica and the practicum in a secondary school setting (grades 5–12). Those selecting community health receive field experience with community agencies, hospitals, and local or state health departments.

**Services Offered by the
Department of Health, Sport,
and Leisure Studies**

All-University Electives in Health Education

The program in school and community health education is interested in the health status of the University community. In an attempt to meet the health needs of students, several elective courses are offered regularly on selected health issues of potential personal and professional interest to any University student. Courses on topics such as stress and health, nutrition, sexuality, mental health, consumer health, drug use/abuse, and aging are designed to provide current information and concepts related to wellness and health promotion. Instruction is organized into lectures, discussion groups, and demonstrations to provide students with the opportunity to understand the significance and application of recent health-related research findings in their own lives.

All-University Elective Courses in Physical Education

A broad selection of electives in dance, sports, aquatics, and fitness activities is offered for all University students. All classes are open to men or women with instructional modifications where appropriate.

The elective program places focus on the lifetime use of sports, dance, and aquatics for recreational satisfaction and participation. Classes are subject to cancellation if enrollments are too low.

Dance Theatre

The Northeastern University Dance Theatre offers students interested in dance as a performing art the opportunity to choreograph and/or perform in concert. In addition to an annual University concert production, this group presents several lecture-demonstrations and/or community concerts each year. Admission to the dance group is by audition.

Intramural and Extramural Sports

Students are provided the opportunity to participate in a comprehensive program of intramural and extramural sports through clubs, leagues, and individual participation. Separate leagues are organized for commuting, dormitory, and fraternity students. Intramural sports are organized separately for men and women and, for certain activities, on a coeducational basis. Throughout the year, intramural and sports club participation may be possible in badminton, football, golf, gymnastics, aerobic dance, swimming, volleyball, water polo, and other sports. A “drop-in” program for individual leisure physical activity is also provided.

Health, Sport, and Leisure Club

Organized by students in the department, the Health, Sport, and Leisure Club participates in projects of student interest which relate to departmental and professional concerns or issues. The club plans for guest speakers, student workshops, information exchange, orientation programs for new students, and a volunteer service for local programs.

Department of Physical Therapy

Jane L. Toot, Ph.D., *Associate Professor and Chairperson*

Assistant Professors

Catherine M. Certo, M.S.

Jeanne Henninger, Ph.D.

David A. Lake, Ph.D.

Robert Sikes, Ph.D.

Clinical Supervisors/Clinical Assistant Professors

Meredith E. Drench, M.Ed.

Clinical Supervisor/Clinical Instructor

Nancy C. Gilberti, M.S.

Nancy Goldin, M.Ed.

Lecturers

Lisa Giallonardo, M.S.

Hollis H. Herman, M.S.

Rose-Marie Rine, M.S.

Daune Tomasiewicz, M.S.

Degree Offered: Bachelor of Science in Physical Therapy

The Department of Physical Therapy is dedicated to the preparation of therapists who can provide services of the highest quality in a time of changing concepts, new trends, and new challenges. Students will have the opportunities to acquire the skill to help patients gain functional independence and to learn to recognize and assist with emotional and socioeconomic problems that affect recovery.

Professional Preparation

Physical therapy is one of the health professions contributing to the delivery of comprehensive health care. The physical therapist is highly skilled in evaluation procedures and in the planning and execution of treatment programs appropriate to a patient's condition or disabilities. Additional responsibilities may include health-care planning and community service.

Physical therapists are employed in institutions such as general hospitals, children's hospitals, university hospitals, rehabilitation centers, schools or centers for disabled children, extended-care facilities, free-standing out-patient clinics, home-health agencies, and community, state, and federal agencies. Private practice is chosen by some physical therapists. In addition, there are increasing opportunities in teaching and research in physical therapy.

The Five-Year Program

The five-year program in physical therapy, based on the Cooperative Plan of Education, is unique in physical therapy education.

The program of study integrates liberal arts and sciences and professional courses, with major emphasis on liberal arts in the first two years of the program and on professional preparation in the last three years. The professional courses include such subjects as anatomy, kinesiology, pathology, clinical medicine, neurology, orthopedics, physiology, physical therapy procedures, administration, and research as well as clinical experience in various hospitals and clinics.

Lecturers from Tufts University School of Medicine and the New England Medical Center hospitals, as well as from medical and social agencies in the Boston area, augment the professional staff in the Physical Therapy program.

Supervised clinical education is a strong component of the curriculum and a requirement for graduation. Clinical experience provides the student with opportunities to practice various phases of physical therapy under supervision in preparation for qualifying as a physical therapist. Assignments in clinical education are not confined to the Boston area. They may include physical therapy departments throughout the country, particularly along the eastern seaboard.

Students admitted to the Department of Physical Therapy must maintain acceptable standards of scholarship and performance in the prescribed program. They must also demonstrate good health, verbal fluency, essential motor skills, and emotional maturity; they must complete all required courses and have favorable evaluations from clinical education and co-op experience. To continue in the program, students are required to maintain a grade of C or better in all professional courses, and in all basic science prerequisite courses listed in the academic policy statement of the Department of Physical Therapy.

All students interested in majoring in physical therapy should contact the Department of Physical Therapy for information regarding departmental academic policies and procedures.

Clinical Education

Students on clinical education assignments should plan on additional expenses, including travel.

Sample Freshman-Year Program

First Quarter

Foundations of Psychology I
 Fundamentals of Mathematics
 Basic Animal Biology I
 Current Issues in Health
 First Aid

Second Quarter

Functional and Basic Calculus
 General Chemistry
 Freshman English I
 Introduction to Physical
 Therapy I

Third Quarter

General Chemistry
 Basic Animal Biology II
 Freshman English II

In addition to the above courses, students may elect to take Basic ROTC.

Basic Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Fundamentals of Mathematics*	8	Human Physiology I	4
Basic Animal Biology*	8	Human Physiology II	4
English*	8	Human Anatomy†	4
General Chemistry*	10	Foundations of Psychology I*	4
Current Issues in Health*	4	4 general electives	16
First Aid	2	Foundations of Psychology II†	4
Physics for Life Sciences I	4		
Lab-Physics Life Sciences I	1		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Introduction to Physical Therapy*	2	Middler-Year Writing Requirement	4
Introduction to Physical Therapy†	2	Physical Therapy V Conference	1
Perceptual and Motor Development	4	Neuroanatomy	5
Clinical Gross Anatomy	6	Physical Therapy VIII	4
Physiology for Physical Therapists	5	Physical Therapy VII	2
Physical Therapy I	2	Research for Physical Therapy	4
Clinical Medicine I, II, III	10	Psychosocial Aspects of Illness	3
Clinical Kinesiology	5	Physical Therapy in the Health-Care System	3
Physical Therapy III	4	Supervised Clinical Education II Clinical Seminar	2
Physical Therapy II	3	Administration	4
Physical Therapy IV	3	Investigative Studies	6
Supervised Clinical Education I	5	Functional Assessment of the Elderly Client	3
Physical Therapy VI	3		
Physical Therapy V	4		
Graduation Requirement			170

Note: Computer literacy must be demonstrated prior to graduation.

* These courses are usually taken in the freshman year.

† These courses are usually taken in the sophomore year.

Human Services

An interdisciplinary major involving the Boston-Bouvé College of Human Development Professions and the College of Arts and Sciences.

John D. Herzog, Ph.D., *Department of Education, Director and Professor*

Advisory Committee

Cathy Cogen, M.A.,
*American Sign Language
Program*

Wilfred E. Holton, Ph.D.,
Sociology and Anthropology

Louise La Fontaine, Ed.D.,
*Department of Counseling
Psychology, Rehabilitation, and
Special Education*

Lawrence Litwack, Ed.D.,
*Department of Counseling
Psychology, Rehabilitation, and
Special Education*

Barbara Schram, Ed.D.,
Department of Education
Lynn M. Waishwell, Ph.D.,
*Department of Health, Sport,
and Leisure Studies*

Harold S. Zamansky, Ph.D.,
Psychology

Fieldwork Supervisor

Natalie H. Riffin, M.Ed.,
O.T.R.

Degree Offered: Bachelor of Science in Education

Professional Preparation

This major offers students the opportunity to prepare themselves for possible careers in one of the areas broadly defined as "human services." The program is interdisciplinary. The human services curriculum allows students the opportunity to obtain fundamental attitudes, knowledge, and skills that may lead to meaningful careers in the helping professions as well as to graduate education in a variety of fields.

Students who major in human services through Boston-Bouvé College may prepare themselves to perform a variety of functions in public and private agencies. Through course work, two quarters of fieldwork experience, and possible co-op jobs, students have the opportunity to explore such areas as: casework services in social service and welfare agencies; therapeutic treatment programs in mental health settings; using American Sign Language in serving deaf clients; supportive counseling in community health centers; rehabilitation counseling services; sheltered workshops; parole counseling; court liaison in programs for delinquent youth; staff work in halfway houses, penal institutions, and drug treatment centers; supportive counseling for the mentally retarded; community organizing; services for the aging; administration in human services agencies; and social program research and evaluation.

The human services program offers a continuing advisory system to help students make the best use of their early course selections and to guide them to appropriate upper-level courses.

College Requirements

Degree requirements differ for each participating College. Refer to pages 93 to 95 for requirements in the College of Arts and Sciences and to page 99 for requirements in the Boston-Bouvé College of Human Development Professions. Students in Arts and Sciences may take a five-year Cooperative Education Program or a four-year full-time program.

The basic aspects of the program are as follows:

1. Prerequisite courses. Prescribed courses in sociology, psychology, government, economics, and human services are required, for a total of six courses.
2. Core courses. Nine courses in areas including statistics, research methods, group process, organizations, personality, intervention strategies, and a senior seminar are required.
3. Specified electives. Three courses in the areas of African-American studies, special education, and/or poverty must be selected from a list of recommended options.
4. Specialization. Each student must take a five-course specialization developed in conjunction with an adviser. Typically, these specializations are in one of three areas: administrative, community, and clinical. Structured specializations have been developed in deaf studies, aging, administration, and other areas. Specific course choices are designed to complement the individual's interests and goals.
5. Fieldwork. Human services students are required to fulfill two fieldwork placements during the last two years of their program. Students must apply for fieldwork assignments early in the quarter before the fieldwork will be done. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. In the past, students have found placements in community programs, nursing homes, vocational workshops, state and federal agencies, and recreational facilities. These experiences are supervised by University staff to maximize the student's learning opportunity.
6. Computer literacy must be demonstrated before graduation.

The human services major offers students the opportunity to obtain useful values and basic knowledge relating to various human services fields. Courses introducing some basic skills can help them to understand and work with a variety of helping services. Cooperative Education job placements provide the opportunity to put classroom knowledge to work and develop professionally through related work experiences.

Human services students at Northeastern have been very active in their major and helpful to each other. The Human Services Student Organization combines social and career-related activities, which in the past have included open houses, bake sales, clothing drives, meals for the homeless, social activities, day-long conferences, and weekend retreats. A quarterly *Human Services Newsletter* is published by students and faculty.

In addition, since 1973, students in Boston-Bouvé College have been committed to the Fenway Project, providing meaningful recreation services and activities to youth and adults living in the Fenway area, including disabled adult residents at Symphony Towers. Students participate as activity planners and leaders, conducting programs in arts and crafts, coordinating outings and social events, as well as Big Brother/Big Sister programs and the annual spring festival. Northeastern students are encouraged to participate in all Fenway Project activities.



Attitude
Personality
Lifestyle ADO
Culture
Subculture
Social class
Family type
Reference groups

Projective techniques
word association
sentence completion
storytelling TAT
(The sentence completion)
Scaling techniques

Perkins chicken as foods
Perkins chicken as query
Perkins chicken as pleasure
Perkins chicken as tough

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

Perkins chicken as 1 2 3

College of Business Administration

Philip R. McDonald, D.B.A., *Dean*

Roger M. Atherton, Jr., Ph.D. *Associate Dean*

Thomas E. Moore, Ph.D., *Associate Dean*

Jay A. Halfond, Ph.D., *Assistant Dean*

Maryann G. Billington, M.B.A., *Associate Dean (Graduate School)*

Dennis Ramsier, M.B.A., *Assistant Dean (Undergraduate Program)*

Christine A. Chevoor, A.B., *Director of External Relations*

Stephen R. DeRosier, M.B.A., *Manager Computer Services*

Kitty J. Meijer, B.A., *External Relations Assistant*

Accounting Group

Professors

Ronald M. Copeland, Ph.D.,
Lillian L. and Harry A. Cowan
Research Professor of
Accounting

Joseph R. Curran, Ph.D.

Paul A. Janell, Ph.D.,
Joseph M. Golemme Professor
of Accounting

Russell W. Olive, D.B.A.

Associate Professors

Richard Lindhe, Ph.D.

Sharon M. McKinnon, Ph.D.

H. David Sherman, D.B.A.

Arnold Wright, Ph.D.

Assistant Professors

Hassanali Espahbodi, Ph.D.

Sue H. McKinley, Ph.D.

Thomas W. Oliver, Ph.D.

Robert G. Ruland, Ph.D.

James F. Volkert, Ph.D.

Lecturers

Michael D. Cottrill, M.S.,
C.P.A.

Ralph M. Grieco, M.B.A.

Finance and Insurance Group

Professor

Wesley W. Marple, D.B.A.

Associate Professors

Joseph W. Meador, Ph.D.

Jonathan B. Welch, Ph.D.

Assistant Professors

Swaminathan Badrinath, Ph.D.

Paul J. Bolster, Ph.D.

Marc Bremer, M.S.

Ronald Johnson, Ph.D.

Duncan Kretoovich, Ph.D.

David N. Leggett, Ph.D.

Donald G. Margotta, Ph.D.

Susan E. Moeller, Ph.D.

Coleen C. Pantalone, Ph.D.

Harlan D. Platt, Ph.D.

Edward M. Saunders, Ph.D.

Vankatesan Srinivasan, Ph.D.

Lecturers

Peggy L. Fletcher, M.B.A.

Victoria McWilliams, M.B.A.

Shirley L. Thompson, M.B.A.

General Management Group*Professors*

Elliott L. Atamian, D.B.A.
Charles D. Baker, M.B.A.
Geoffrey P. E. Clarkson, Ph.D.
Robert C. Lieb, D.B.A.
Daniel J. McCarthy, D.B.A.

Associate Professors

Stanley R. Berkowitz, J.D.
Jonathan L. S. Byrnes, D.B.A.
John Diffenbach, D.B.A.
Angelo J. Fiumara, J.D.
Robert H. Ketchum, Ph.D.
Raymond M. Kinnunen,
D.B.A.

James F. Molloy, Jr., Ph.D.
Ravi Sarathy, Ph.D.
Heidi Vernon-Wortzel, Ph.D.

Assistant Professors

Deborah J. Bickford, Ph.D.
William F. Crittenden, Ph.D.
Ali R. Malekzadeh, Ph.D.
Marc H. Meyer, Ph.D.
Ravi Ramamurti, Ph.D.
William Tiga Tita, Ph.D.

Lecturers

Joseph W. Chevarley, Jr.,
M.P.A.
Mary E. Costello, J.D.

Human Resources Group*Professors*

Richard B. Higgins, Ph.D.
Ralph Katz, Ph.D.

Associate Professors

Thomas M. Begley, Ph.D.
David P. Boyd, Ph.D.
Christine L. Hobart, D.B.A.
Edward F. McDonough, III,
Ph.D.
Andre P. Priem, M.A.
Francis C. Spital, Ph.D.
Edward G. Wertheim, Ph.D.

Assistant Professors

Rae Andre, Ph.D.
Brendan D. Bannister, Ph.D.
Mark P. Kriger, D.B.A.
Paulette A. McCarty, Ph.D.
Afsaneh Nahavandi, Ph.D.
William C. Ronco, Ph.D.
Bert A. Spector, Ph.D.

Lecturer

Diane Franklin, Ph.D.

Management Science Group*Professor*

Michael J. Maggard, Ph.D.

Associate Professors

R. Balachandra, Ph.D.
Peter J. Billington, Ph.D.
Sangit Chatterjee, Ph.D.
Kathleen Foley Curley, D.B.A.
Victor B. Godin, D.B.A.
Robert A. Millen, Ph.D.
Carl W. Nelson, Ph.D.
Robert A. Parsons, M.B.A.
Eileen Trauth, Ph.D.
Mustafa R. Yilmaz, Ph.D.

Assistant Professors

Edward G. Cale, Jr., D.B.A.
Nancy Jo Klein Delaney, Ph.D.
Allen G. Greenwood, Ph.D.
Katherine Taylor Halvorsen,
D.Sc.
Stephen K. Kwan, Ph.D.
Allen S. Lee, Ph.D.
Thomas P. McWilliams, Ph.D.
Fanny L. O'Brien, Ph.D.
Marjorie Platt, Ph.D.
Bharat C. Ruparal, D.B.A.
Marius M. Solomon, Ph.D.

Marketing Group

Professors

Gerrit De Vos, Ph.D.
Robert J. Minichiello, D.B.A.
Frederick Wiseman, Ph.D.

Associate Professors

Dan T. Dunn, D.B.A.
Edward T. Popper, D.B.A.
Samuel Rabino, Ph.D.
Robert F. Young, D.B.A.

Assistant Professors

Deirdre M. Bird, Ph.D.
Kristina Cannon-Bonventre,
Ph.D.
Jerry Kirkpatrick, Ph.D.
Keith B. Murray, Ph.D.
Anil M. Pandya, Ph.D.

Lecturers

John Friar, M.B.A.
Linda Jamieson, M.S.
Saul Klein, M.B.A.
John A. Sims, Jr., M.B.A.

Degree Offered: Bachelor of Science in Business Administration

The programs in the College of Business Administration are designed for men and women seeking to prepare themselves for managerial responsibility in business, government, and other organizations with the goal of developing the ability to recognize and solve problems and to understand the role of the business firm in the community, the nation, and the world.

In developing these skills, the students have the opportunity to gain not only a broad understanding of business and organizational problems through specialized courses, but also firsthand knowledge of effective solutions. Forty to sixty percent of the course work in the College of Business Administration curriculum is centered in the sciences, humanities, and social sciences to ensure a liberal education.

The College of Business Administration offers concentrations in the principal fields of business: accounting, entrepreneurship and new venture management (small business management), finance and insurance, human resources management, international business, management, marketing, and transportation and physical distribution management. There is also a provision for those students who wish to design their own concentrations.

All concentrations are offered only on the five-year Cooperative Plan of Education, providing most students with substantial practical experience, usually in the fields for which they are preparing.

In keeping with the current trends in collegiate education, the College has adopted the following educational aims for its students:

1. To develop attitudes and ideals that are ethically sound and socially desirable;

2. To cultivate an awareness of the social, political, and economic developments to which the business firm must adapt;
3. To develop the habits of accurate thinking that are essential to sound judgment and the habits of accurate expression that are essential to effective communication;
4. To provide an opportunity to develop a specialization in business in accordance with their interests and talents.

The Five-Year Program

The College of Business Administration offers a Bachelor of Science in Business Administration degree with concentrations of courses in several areas. The College combines its business curriculum with courses from the sciences, humanities, and social sciences. Students must take courses in these areas to ensure the well-rounded background that is so valuable in the business world.

All students in the College are required to complete, in addition to their academic courses, the Cooperative Plan of Education. This program gives the student the opportunity to challenge and reinforce in the work place the theories and techniques learned in the classroom. In a similar way, the "well, that's the way they do it in my co-op company" attitudes can be and are questioned in the classroom. This double-faceted approach enhances the entire education process. The added experience of co-op work assignments, when combined with course work, offers each student practical exposure to the responsibilities of various administrative positions as well as help in determining the kind of organization in which he or she would like to work. Cooperative work assignments generally are paid, full-time, professional positions with organizations both in the profit and not-for-profit private sector and in government. Work assignments are for six months of each year above the freshman level.

After the course work foundation of the first two years, the final three years emphasize the various functional areas of business and require students to concentrate their studies in specific areas. (Detailed descriptions of these areas follow this section.) In most of these upper-division courses the traditional lecture-and-recitation format is supplemented by problem-solving and case-study methods. Using these, students analyze actual businesses and business problems and present recommendations for possible solutions. Students are encouraged to develop the ability to think independently, to support ideas with fact and logic, and to analyze and challenge propositions. Special classrooms have been designed for the College to facilitate the case method of instruction.

Professional Preparation

For the 1990s, the outlook for exciting careers in business administration is optimistic. The challenges that business faces from the effects of foreign policy, high technology, affirmative-action regulations, and new economic policies tend to create a demand for highly trained individuals equipped to analyze the complex problems of our modern-day economy.

Upon completion of the Bachelor of Science in Business Administration degree, the graduate may choose to enter the work force (many former students have assumed full-time positions with former co-op employers) or go on to pursue higher degrees.

In general, students find that graduate schools view a B.S. degree in Business Administration as solid preparation for graduate work, not only in business but also in public administration, health-care administration, and education administration. Law schools look favorably on the prelegal background obtained in business school. Although the Association of American Law Schools does not recommend particular courses or curricula for prelegal students, it does advise undergraduates to develop critical understanding of the institutions and values with which the law deals. Many careers in law are directly involved in the business world, either in large corporations or in private practice.

The College's curriculum offers students the opportunity to develop a broad understanding of the business environment, as well as to acquire the specific skills necessary to manage organizations in today's complex social and legal environment.

Honors Program

The College of Business Administration participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

The Minor Program

The College of Business Administration faculty, realizing that many students may have an interest in business yet major in other disciplines, offers a minor in business administration. The College of Arts and Sciences, which teaches some of the courses, collaborated in the design of the minor.

The program has been designed so that students who complete the minor will have a background in disciplines that serve as foundation courses for the study of business and as an exposure to its various functional areas. In addition there is an exploration of the relationship between business and society and the obligations of each to the other.

Students of the Basic Colleges other than the College of Business Administration may find the minor particularly attractive if they are considering a career in business and/or are contemplating enrolling in an MBA program, but are not sure what is involved

in the study of business. Qualified students who have completed the five background and methodology courses apply for formal admission to the minor after they have accumulated eighty or more quarter hours of credit.

Minor in Business Administration Program					
Background and Methodology (completed prior to formal entry into the minor)		Business Functions		Business and Its Environment	
Course	Q.H.	Course	Q.H.	Course	Q.H.
College Algebra	4	Introduction to Business	4	One course from the approved list	4
Macroeconomics	4	Introduction to Accounting	4		
Microeconomics	4	Organizational Behavior	4		
Descriptive Statistics	4	Introduction to Finance	4		
Inferential Statistics	4	Introduction to Marketing	4		
		Operations Management	4		
Total Quarter Hours	20	Total Quarter Hours	24		

After a student has completed all program components, the College of Business Administration will so notify the student's Basic College so that appropriate recognition can be made.

Graduation Requirements

Candidates for the bachelor of science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. This presently totals 176 quarter hours of credit. The degree conferred not only represents the formal completion of selected courses of study, but also indicates professional study in the designated area of concentration. An overall average grade of C and a C average in required courses are necessary for graduation.

Students must be enrolled in a full program of studies in the College of Business Administration during the final three quarters immediately preceding graduation.

Graduation with Honors

Candidates who have achieved superior grades in their academic work will be graduated cum laude. Upon special vote of the faculty, a limited number of this group may be graduated magna cum laude or summa cum laude. Students must have been in full-time attendance at the University at least six quarters before they can become eligible for honors at graduation.

Accreditation

The undergraduate program of the College of Business Administration is fully accredited by the American Assembly of Collegiate Schools of Business, indicating that the program meets the accrediting agency's standards for faculty and student quality, curriculum design, and overall University support.

Sample Freshman-Year Program

First Quarter

Introduction to Business
Fundamentals of Math
Non-business elective
Economics (macro)

The sample freshman-year program and the basic course requirements for the College of Business Administration are the same for all concentration areas.

Second Quarter

Accounting I
English Composition
Two non-business electives

Third Quarter

Accounting II
English Literature
Non-business elective
Economics (micro)

Students who will complete the Reserve Officers' Training Corps program are permitted to drop one elective each quarter of their senior year. Individual ROTC courses carry no credit toward graduation. The College of Business Administration has no physical education requirement. Students wishing to take courses in physical education may take a maximum of eight quarter hours as elective credits.

I. Basic Course Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Fundamentals of Math	4	Statistics I & II	8
Quantitative Models in Business	4	Introduction to Data Processing	4
English*	8	Organizational Behavior	4
Introduction to Business	4	Complex Organizations	4
Accounting I & II	8	Operations Management	4
Economics (macro)	4	Managing Social Issues	4
Economics (micro)	4	Business Policy	4
Introduction to Finance	4	Non-business electives**	44
Introduction to Marketing	4	Open electives	32

* In addition, all students must complete the Middler-Year Writing Requirement (normally taken by business students in the junior year).

** For international business majors, 8 Q.H. of this total must be from the international list. For all other students, 4 Q.H. must be from the international list.

Accounting Concentration

Accounting is a fast-growing and critical area of business. It is an exacting field that requires men and women who enjoy dealing with facts and figures as well as with people. It requires accuracy and an ability to reason and to interpret business data.

Professional Preparation

A student who anticipates a career in accounting probably is interested in one of its two major areas: industrial accounting or public accounting. To enable such a student to obtain some of the professional background necessary to enter these fields, the College of Business Administration offers a variety of financial accounting and managerial accounting courses.

Preparation for a career in accounting encompasses a broad range of activities. These include all phases of record keeping, internal and external reporting, financial planning, cost control,

the design and installation of systems and procedures, the application of electronic and other modern business methods to these activities, and managerial decision-making.

The Five-Year Concentration

During the first two years, the accounting student will have the opportunity to develop communicative and analytical abilities, to gain an understanding of the nature of accounting, and to survey business as a dynamic institution in an economic setting. Another important activity will be consultation with a coordinator from the Department of Cooperative Education about future work assignments.

Subjects in the third year will include courses in the various functional areas of business (marketing, finance, operations, personnel), statistical analyses, and economic activity.

Whether a student chooses employment in the industrial accounting or public accounting area, he or she will have the opportunity to prepare through specialized courses in the third and subsequent years. Subjects will include cost accounting, accounting theory, planning and control, auditing, and taxes.

In addition to the sample freshman-year program and basic course requirements listed on page 133, students who concentrate in accounting are required to take the following courses:

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Intermediate Accounting I, II, & III	12
Cost Accounting I & II	8
Accounting Theory and Practice or Accounting Planning and Control	4

Entrepreneurship and New Venture Management Concentration

The concentration in entrepreneurship and new venture management (small business management) offers students who plan to work in or operate their own businesses an opportunity to develop skills necessary for the effective management of small enterprises.

Professional Preparation

Students who choose this concentration have a wide variety of motivations. Some have hopes of starting, or acquiring, and operating their own businesses. Others have the opportunity to join a family business upon graduation. Still others have views of or experience with large corporations that have made them think about life in a smaller organization. And some think that they would enjoy working for a small company and wish to learn more about opportunities with smaller firms.

Some students are considering a career in sales management, banking, public accounting, management consulting, or other areas that may involve them directly with owners and managers of new and small companies. For example, a bank loan officer, sales manager, or CPA would often have many entrepreneurs and small-company officers as clients.

A concentration in this field offers a thorough “start-to-finish” perspective. The concentration provides courses that deal with each of these key questions:

1. What are the characteristics of people who start their own companies, and what does it take to start and build a new business?
2. What are some key sources of business opportunities, and how does one assess the feasibility of a particular venture?
3. What sources exist for raising seed capital, and how does one acquire it?
4. What are the critical problems and opportunities in successfully managing a smaller company, and what are the appropriate managerial methods?
5. What are the key issues in financing and managing an ongoing, growing venture, and how can these be applied to small ventures?

The Five-Year Concentration

Courses in this concentration benefit students in several ways. They offer the opportunity to develop an ability to assess personal aptitude and potential for small business, to find and evaluate business opportunities, to secure adequate funding, and to organize and manage the various facets of the small business—marketing, finance, control, and personnel.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 133.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
New Venture Creation	4
Opportunity Analysis & Venture Capital	4
Small Business Finance	4
Management of Smaller Enterprises	4
Small Business Institute Field Project	8

Finance and Insurance Concentration

The objective of the finance and insurance concentration is to train students for the financial management of businesses, non-profit organizations, and governmental units. Preparation is two-fold: 1) students are offered information about current practices, theories, and concepts of financial management, and 2) they have the opportunity to gain experience in analyzing situations that require financial decisions.

Professional Preparation

Almost every phase of economic activity involves aspects of financial management—of cash or other funds and of economic resources available to the individual, the business, or other economic unit.

The finance and insurance concentration can help prepare students for future careers in one of the many areas of funds management: security analysis, estate planning, corporate finance and control, financial planning, security or insurance brokerage, underwriting, credit management, and banking.

There are also career possibilities in specific financial institutions that perform indispensable services for present-day business and industry. Among these are banks, insurance companies, investment houses, credit concerns, financial service institutions, mortgage companies, and national and local real estate brokerage firms and appraisers.

Career openings can be sought in all areas of business, industry, and government, where financial planning and operation are vital.

The Five-Year Concentration

In the middler year, students take Introduction to Finance and beginning courses in other business fields. Following the introductory course, the required courses are Managerial Finance, Investment Management, and Financial Institutions and Markets. Many electives are available, including Securities Markets, Small Business Finance, Management of Financial Institutions, and Insurance. In addition, an independent study often may be an appropriate elective.

Specialization occurs in the upperclass years: students then take advanced courses in insurance, investments, security markets, and basic business finance. To provide a well-rounded education, other courses are available, particularly in the broad area of economics.

All courses offered in Finance and Insurance are open to students in any concentration within the College of Business Administration provided they have taken the prerequisite subjects. Instructors may waive prerequisite courses in special circumstances.

Managerial Finance Specialization

The two objectives of the finance function in the contemporary corporation or business entity include:

1. Providing needed funds on terms that are the most favorable in view of current planning;
2. Regulating the flow of funds to maximize the realization of objectives.

The key concerns of financial management are the capital structure of the business and the optimal manner in which its assets should be held. With only minor differences, these same broad objectives apply to the finance function of nonprofit organizations, including those in the public sector (units of government).

Management of Financial Institutions Specialization

This area is broadly based within the subject area and is applicable to a variety of financial institutions and positions within them.

The three major topics of consideration in this area of specialization are:

1. The institutional structure of the financial system and the relation between it and the surplus and deficit units of the whole economy;
2. Asset, liability, and capital management problems of financial intermediaries;
3. Investment analysis and portfolio management policies appropriate to different financial intermediaries.

Investment and Management Analysis Specialization

Two benefits result from studying this specialization. First, students can gain a general understanding, which may help them manage their own affairs. Second, those seeking professional careers in organizations where the investment function is paramount (industrial and utility corporations, real estate developments, financial institutions, and many governmental agencies are a few examples) will find this specialization of great assistance.

The specialization offers preparation in the specialized skills and principles that can benefit students who are interested in careers as investment managers or security analysts in the following organizations:

1. Stock exchanges, investment advisory firms, brokers-dealers, underwriters, mutual funds, and other investment companies that are a part of the securities markets;
2. Insurance companies, commercial banks, savings and loan associations, trust companies, mutual savings associations, and organizations involved in the activities of the securities markets; or
3. Federal and state governmental agencies such as the SEC, FDIC, Treasury Department, IRS, and others having regulatory responsibilities regarding the securities markets and their participants.

Insurance and Risk Management Specialization

Risk management is the process of identifying, measuring, evaluating, and treating important risks. It is a relatively new, but growing, part of the management function in business as well as in government and other nonprofit organizations. Insurance is an important method of risk financing in all organizations, including the family unit. Some individuals may study one or a few courses in insurance and risk management to broaden their understanding of this area in order to better manage their personal affairs or to familiarize themselves with this area as part of their general management preparation. Others may wish to specialize in this area and seek careers in the risk management function in business as managers of corporate employee benefits programs; or as managers, adjusters, or underwriters in life insurance companies, property and liability insurance companies, insurance brokerage firms, insurance agencies, independent adjusting firms; or in a number of other careers in this vast field.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 133.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Managerial Finance	4
Financial Institutions and Markets	4
Investment Management	4
Finance electives	12

Human Resources Management Concentration

Human resources management, which focuses on the effective utilization of people at work, is an extension of personnel and labor relations. However, it includes more than the traditional areas of recruitment, selection, compensation, and training. A human resources manager also must be knowledgeable about manpower planning, equal employment opportunity laws and affirmative action procedures, organizational development, career planning, job design and motivation, leadership, and communications. The ultimate goal of human resources managers is to provide an organization with the people who will be most effective in their jobs.

Professional Preparation

In recent years there has been a growing interest in the quality of the employee's work life and its relation to the efficient production of goods and services. At a time when financial resources and investment capital are becoming scarcer, many organizations are

beginning to take a closer look at the management of their people, their most precious resource. In recognition of this growing interest, Northeastern University's College of Business Administration offers an undergraduate concentration in human resources management.

The effective management of human resources calls for a joint partnership among such organizational specialists as personnel administrators, labor relations negotiators, wage and salary analysts, and operating line managers in the various functional areas (marketing, finance, production) of the company. As the traditional role of personnel administration is expanded to include affirmative action programs, job enrichment, and organizational development activities, career opportunities in the fields of labor relations and personnel administration are likely to expand in both the public and private sectors.

For the student whose career aspirations lie in fields other than personnel and labor relations, one important point should be made: human resources management is not a specialized activity confined to the personnel department. Whether a graduate starts his or her career as a work-flow analyst in manufacturing, a customer service assistant in marketing, a field auditor in the accounting department, or a hospital unit manager, he or she will be required to demonstrate skills in working with individuals and groups to achieve desired results.

The Five-Year Concentration

Human resources management is practiced not only by specialists in the area of personnel and labor relations, but also by line managers and specialists in many other business areas. The human resources management concentration is structured to expose students to all major functions of personnel administration and labor relations.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 133.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Introduction to Human Resources Management	4
Assessment of Prospective Employees	4
Contemporary Labor Issues	4
Reward Systems	4
Human resources management electives	8

International Business Concentration

In recent years, several factors have contributed to a rapidly increasing need for qualified people in the field of international business. The growth of multinational firms, international trade, and regional international trading blocs has created a shortage of skilled managers who are equipped to analyze the complexities of international business problems.

Careers in international business are best pursued in companies that carry on trade or manufacturing operations in foreign countries. An increasing number of multinational firms require that candidates for their top management positions have prior experience in international operations. In addition, large banks and insurance companies want their managers to understand international business. Other types of organizations—government, trade associations, large unions—require international business knowledge. The opportunity for foreign travel in any of these capacities is frequently available.

Professional Preparation

The international business concentration offers students the opportunity to prepare themselves to meet these management needs. It offers the opportunity to develop an understanding of problems involved in operating business enterprises across national boundaries and to develop the ability to analyze the operations of businesses in multinational environments.

The Five-Year Concentration

The curriculum consists of a broad education provided by course requirements in arts and sciences, a basic business education provided by business administration core requirements, and a specialized education in international business.

The international business concentration consists of six courses. Two of them are required: Introduction to International Business and Seminar in International Business. There are also four electives: two from the international business list and two business electives. In addition, two of the non-business electives in the basic course requirements must be chosen from the international list (see page 141).

The student who enrolls in the international business concentration will find that its structure is flexible, permitting a dual concentration. For example, a student may concentrate in international business and use open electives to fulfill the requirement of a second concentration. The dual concentration has advantages for those seeking employment opportunities in traditional functional areas (e.g., production, marketing, finance), which also take place in an international setting. All College of Business Administration courses that are offered as part of the international business concentration are available to students in other concentrations during their middler, junior, and senior years.

Students who choose the international business concentration have the opportunity to gain an understanding of the economic, political, and social constraints on international business and to develop skills in analyzing the financial, marketing, and operational strategies of the multinational firm.

Arts and Sciences electives such as modern languages, political science, international economics, geography, and cultural anthropology—all appropriate to the understanding of international relations—are highly recommended to complement this concentration.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 133.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Introduction to International Business	4
Seminar in International Business	4
Business international electives	8
Business electives	8

International Electives

Business List*

Introduction to International Business
 Seminar in International Business
 International Marketing
 International Finance
 Comparative International Management
 Environmental Pressures and Corporations
 International Transportation

Non-Business List**

Africa Today
 Economics of World Energy
 European Economic Development
 Economic History of Less Developed Countries
 Development Economics
 International Economics
 Modern Western Economic History
 Social Change and Economic Development
 Peoples and Culture of China
 Contemporary Japanese Society and Culture
 Introduction to International Relations
 Introduction to Foreign Governments
 European Political Parties

* These courses are not offered every year. Students are advised to consult preregistration material.

** This is a representative listing; other liberal arts courses may be taken upon approval of the area coordinator for the international business concentration.

Arab-Israeli Conflict
World Politics
Euro-Communism
American Foreign Policy
Soviet Government
Soviet Foreign Policy
Communism in Eastern Europe
International Organization
International Law
Government and Politics of China
China's Foreign Relations
The Politics-Policies of Developing Nations
Government and Politics of Latin America
Government and Politics of Japan
Government and Politics in the Middle East

Management Concentration

Management is an area of business that involves men and women who enjoy working with numbers as well as people. Basically, it is the process of getting things done through people; by using basic business skills developed in a well-rounded program of Business Administration.

Professional Preparation

For the student whose career interests lie in the broad area of administration rather than in specialized fields, the management concentration offers the opportunity to prepare for a wide variety of administrative careers in business, government, and nonprofit institutions.

The Five-Year Concentration

Management students must have a basic understanding of all organization functions: accounting, marketing, finance, and operations. Courses in these subjects offer an overview, including the interrelation of these areas, and the ways they can be used as management tools. For example, knowledge of accounting can be a helpful tool in the decision-making process, rather than only a specialty. A similar approach is used in courses in other areas. Professors pay significant attention to "people problems" to stress the importance of developing an effective work force.

The courses in the management concentration vary considerably in content and method of instruction because they vary in their objectives. In most, students are heavily involved in the conducting of classes and are required to work on group assignments. The purpose of this participatory approach is to help prepare students for the demands of management in the business community.

The curriculum and teaching methods center around the development of basic skills and knowledge appropriate to administration, rather than upon specialized functional techniques. Although the case method of study is used extensively, a variety of teaching methods consistent with particular course objectives are employed. The basic objectives of the concentration are to confront students with appropriate learning experiences, to help increase students' skills and knowledge in basic disciplines underlying administrative practice, and to help students develop judgment and skills in organizational problem analysis and decision making.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 133.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Cost Accounting for Management	4
Introduction to Human Resources Management	4
Legal Aspects of Business	4
Business electives	12

Marketing Concentration

A business organization not only designs and manufactures products, but also markets and sells them to manufacturers, wholesalers, retailers, and consumers. This is what a concentration in marketing is all about.

All the business activities that direct the flow of goods and services from producer to consumer are classified as marketing concerns. The marketing process begins by determining the needs and wants of customers. Once these wants and needs are established, the organization's first objective is to produce goods or services to satisfy a particular consumer. Essential in all types of business are such activities as product design, research, pricing, packaging, transportation, advertising, selling, and servicing. The overall responsibility for these functions rests with the marketing manager.

Without successful marketing and advertising, industrial products remain unsold. More and more companies are finding that today's tempo of progress and high levels of production require up-to-date marketing techniques to generate a higher sales volume.

Professional Preparation

Growing concern with unfair and deceptive advertising, product defects, pricing practices and other consumer-oriented concerns has made public policy issues a major concern of marketers. As a result, students of marketing are now enjoying career positions within the government sector, as well as the private sector. Other

career possibilities involve aspects of marketing such as advertising, retailing, new product development, and sales management.

Success in the market is vital to every company, whatever its size. Therefore, the need for adaptable and informed marketing management exists in all types of business and industry.

The Five-Year Concentration

The marketing concentration offers a wide variety of courses, taught by lecture and class discussion. Included are such courses as Marketing Management, Advertising, Sales Management, Consumer Behavior, and Competitive Strategy.

Outside the classroom, students may attend weekly meetings of the American Marketing Association student chapter, through which they may further their interests by discussing issues with leaders in the field.

As members of the management policy group, marketing executives take a broad view of all aspects of business management and policy. They also serve effectively as trained specialists in their own areas.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 133.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Marketing Management	4
Marketing Research	4
Competitive Strategy	4
Marketing electives	12

Transportation and Physical Distribution Management Concentration

Transportation is an integral part of national and international distribution systems. It is a determining factor in the availability and prices of goods and services in our economy.

Professional Preparation

In corporate distribution, transportation specialists operate within a complex organizational framework in which goods are stored and moved. Effective management of this distribution process involves understanding inventory control, warehousing, transportation options, and the interaction of these activities with other functional operations.

Growing concern with the economic and service conditions of the transportation industry has also created career positions with government agencies engaged in transportation policy development and administration. Other career possibilities are to be

sought with carriers such as airlines, railroads, and trucking companies, which actively seek people who are familiar with the operational and regulatory aspects of their business.

The transportation and physical distribution management concentration offers students opportunities to prepare for these diverse career opportunities.

The Five-Year Concentration

The concentration offers the student a balanced background in transportation and physical distribution management. Courses consider not only the viewpoint of the corporate shipper and carriers, but also those of public officials, in addition to consumer interests. Courses have a strong contemporary orientation and promote frequent interaction with practitioners from business and government.

Course offerings in transportation and physical distribution management are sequential so that students who desire only an introductory exposure may take one or several courses as part of a broader business background. An undergraduate concentration in the area consists of six courses. Four are required courses, with the balance of the concentration composed of electives.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 133.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Principles of Transportation	4
Physical Distribution Management	4
Current Issues in Transportation Policy	4
Seminar in Transportation	4
Transportation electives	8



College of Computer Science

Paul M. Kalaghan, Ph.D., *Dean*

Mitchell Wand, Ph.D., *Associate Dean and Director of Graduate Studies*

Helen B. Howard, B.S., *Assistant to the Dean*

Professors

Harriet J. Fell, Ph.D.

Karl J. Lieberherr, Ph.D.

Richard A. Rasala, Ph.D.

Alan L. Selman, Ph.D.

Raoul N. Smith, Ph.D.

Mitchell Wand, Ph.D.

Patrick S. P. Wang, Ph.D.

Associate Professors

Kenneth P. Baclawski, Ph.D.

Cynthia A. Brown, Ph.D.

John Casey, B.A.

Agnes H. Chan, Ph.D.

Gene D. Cooperman, Ph.D.

Larry A. Finkelstein, Ph.D.

Robert P. Futrelle, Ph.D.

Stephen I. Gallant, Ph.D.

Carole D. Hafner, Ph.D.

Viera K. Proulx, Ph.D.

Betty J. Salzberg, Ph.D.

Ronald J. Williams, Ph.D.

Joint Associate Professor (Mathematics)

R. Mark Goresky, Ph.D.

Assistant Professors

Abbas Birjandi, Ph.D.

Khaled M. Bugara, Ph.D.

Frank R. Campagnoni, Ph.D.

Harpal S. Dhama, Ph.D.

Andrew M. Klapper, Ph.D.

W. David Shambroom, Ph.D.

Lecturers

Philip F. Carrigan, Ph.D.

Pedro J. de Rezende, M.Sc.

Terry M. Smith, M.S.

Degree Offered: Bachelor of Science in Computer Science

Computer science is a multifaceted discipline. It spans parts of pure mathematics and applied mathematics, it touches physics through solid state devices, it pushes at the borders of biology and psychology in its attempts to understand and replicate intelligence. It shares much common ground with electrical engineering in the study of computer architectures and the complexity of VLSI design, and, finally, it supports business and commerce with the tools of database and information systems and computer graphics.

In spite of the diversity of interests within the discipline, computer science may be broadly subdivided into four major areas: applications, systems, theory, and technology. In the *applications* area, the academic curriculum is focused on creation of the software that makes computers useful. Instruction and research projects are devoted to the development of applications software. Expert systems, database systems, computer graphics, symbolic computation, computer-aided instruction, and numerical simulations are only a few of the many specific applications areas.

The *systems* area of computer science centers on the design of the large-scale programs that are the software core of a functioning computer—operating systems, programming languages, compilers, debuggers, and editors. The specific areas of interest in systems are artificial intelligence, networks, parallel processing, compiler design, and software engineering.

Theory deals with the design and analysis of algorithms, building and testing large programs, design of programming languages, and development of tools to handle concurrent processes, parallel computation, and networks. The specific areas of interest in theoretical computer science are algorithms for artificial intelligence systems, networks and parallel computation, cryptography, graph theory, and program verification.

The focus of the College of Computer Science vis-à-vis *technology* is on the identification of appropriate machine architecture for each of the interests discussed. The actual design of hardware is clearly left to the engineering departments and to industrial hardware designers across the nation.

The academic soundness of the program is assured by the curriculum, which closely follows the recommendations of the two national professional societies, the Association for Computing Machinery and the Institute for Electrical and Electronic Engineers. Technological soundness is maintained by continuing review of the program by an advisory committee composed of leaders of the computer industry.

Professional Preparation

The College of Computer Science offers students the opportunity to concentrate in the broad field of computer science. The program is designed for men and women who are seeking to prepare themselves for productive careers in industry, government, or other organizations that design, develop, market, or utilize com-

puting systems. Students may become software designers, systems analysts, business or scientific applications programmers, marketers or salespersons of technologically advanced products, while others may become entrepreneurs and founders of their own firms. A fundamental goal of the College is to help students develop the ability to recognize and solve problems arising in the use of modern digital computers.

In developing the skills necessary to achieve this goal, the student has the opportunity to assimilate ideas and concepts from theoretical studies; in-depth, hands-on programming of both large time-sharing systems and single-user microcomputers; and practical insight gained from the cooperative education experience.

The Five-Year Program

The primary goal of the College is to graduate software professionals educated over a broad range of both technical and non-technical disciplines. The College's undergraduate curriculum is a five-year cooperative education program that incorporates alternating periods of classroom instruction and career-oriented work experience extending from the second through the fifth year.

In the lower level part of the curriculum, the student is introduced to problem solving and software design methodology, using a multiplicity of languages from high-level Pascal and LISP to VAX assembler together with data structure concepts. Simultaneously, the student may learn analytical skills through calculus and discrete mathematics.

In the upper level, the student is introduced to computer architecture, operating systems, database systems, compiler design, computer graphics, artificial intelligence concepts, and the advanced analytical techniques underlying much of modern systems design. Since many of these subjects are part of three-course sequences, the student may select entire sequences for a more detailed perspective of a subject area.

In order to give the student a deeper understanding of at least one major area of the discipline, the upper level curriculum contains emphasis tracks, three-course sequences spanning one subject area. These sequences form an in-depth introduction to the specific area and culminate in a software project which focuses on the application of theoretical concepts to practical situations. All students must take at least one complete track in order to graduate. Current emphasis tracks cover database management, programming languages, and systems.

The curriculum also requires that a student take courses in Western culture, in the societal impact of computing, and in technical writing skills. To further broaden his or her horizon, the student is encouraged to take a minor area of study (subarea, a block of five courses within a single discipline) in a non-technical area such as business administration, education, art, psychology, or sociology.

Honors Program

The College of Computer Science participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

Sample Freshman-Year Program

(Applicable to students graduating in June 1988, 1989, and 1990)

First Quarter		Second Quarter		Third Quarter	
<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Pascal I	4	Pascal II	4	Data Structures	4
Calculus I	4	Calculus II	4	Calculus III	4
Freshman Writing	4	Discrete Mathematics I	4	Introduction to Literature	4
Western Civilization	4	Western Civilization II	4	Physics I	4
		COBOL Language		FORTTRAN Language	
		Laboratory	1	Laboratory	1

Basic Course Requirements

Second Year	Fourth Quarter		Fifth Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Functional Programming and Applications	4	Computer Organization and Programming II	4
	Computer Organization and Programming I	4	Software Design and Development	4
	Physics II	4	Physics III	4
	Calculus IV	4	Discrete Mathematics II	4
	DCL or C Language Laboratory	1		
Third Year	Sixth Quarter		Seventh Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Computer Organization and Design I	4	Computer Organization and Design II	4
	Linear Algebra	4	Probability	4
	Elective/subarea (1)	4	Technical Writing	4
	Computer science elective (1)	4	Computer science elective (2)	4
Fourth Year	Eighth Quarter		Ninth Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Elective/subarea (2)	4	Computers and Society	4
	Elective/subarea (3)	4	Elective/subarea (4)	4
	Computer science elective (3)	4	Computer science elective (5)	4
	Computer science elective (4)	4	Computer science elective (6)	4
Fifth Year	Tenth Quarter		Eleventh Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Computer science elective (7)	4	Computer science elective (8)	4
	Elective/subarea (5)	4	Computer science seminar	1
	Elective/subarea (6)	4	Elective/subarea (8)	4
	Elective/subarea (7)	4	Elective/subarea (9)	4
			Elective/subarea (10)	4

Note: Three of the computer science electives must form a complete track.
 Database track: *File Structures, Database Management I, Database Management II.*
 Systems track: *Systems Programming, Operating Systems I, Operating Systems II.*
 Programming Languages track: *Automata and Formal Languages, Compiler Design I, Compiler Design II.*

Sample Freshman-Year Program

(Applicable to students graduating on or after June 1991)

First Quarter		Second Quarter		Third Quarter	
<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Fundamentals of Computer Science	4	Algorithms and Data Structures I	4	Algorithms and Data Structures II	4
Calculus I	4	Calculus II	4	Calculus III	4
Freshman Writing	4	Discrete Mathematics I	4	Introduction to Literature	4
Western Civilization I	4	Western Civilization II	4	Physics I	4
		COBOL or FORTRAN Language Laboratory	1	Physics Laboratory I	1

Basic Course Requirements

Second Year	Fourth Quarter		Fifth Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Computer Organization and Programming I	4	Computer Organization and Programming II	4
	Physics II	4	Physics III	4
	Physics Laboratory II	1	Discrete Mathematics II	4
	Elective/subarea (1)	4	C Language Laboratory	1
			Elective/subarea (2)	4
Third Year	Sixth Quarter		Seventh Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Functional Programming and Applications	4	Software Design and Development	4
	File Structures*	4	Automata Theory	4
	Computer Organization & Design I	4	Computer Organization and Design II	4
	Elective/subarea (3)	4	Technical Writing	4
Fourth Year	Eighth Quarter		Ninth Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Systems Programming*	4	Computers and Society	4
	Linear Algebra	4	Probability	4
	Computer science elective (1)	4	Computer science elective (2)	4
	Elective/subarea (4)	4	Elective/subarea (5)	4
Fifth Year	Tenth Quarter		Eleventh Quarter	
	<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
	Computer science elective (3)	4	Computer science elective (5)	4
	Computer science elective (4)	4	Computer science seminar	1
	Elective/subarea (6)	4	Elective/subarea (8)	4
	Elective/subarea (7)	4	Elective/subarea (9)	4
			Elective/subarea (10)	4

Note: Three of the computer science electives must form a complete track.
 Database track: *File Structures, Database Management I, Database Management II.*
 Systems track: *Systems Programming, Operating Systems I, Operating Systems II.*
 Programming Languages track: *Automata and Formal Languages, Compiler Design I, Compiler Design II.*

* A student wishing to complete the systems track may reverse the order of these two courses.



College of Criminal Justice

Norman Rosenblatt, Ph.D., *Dean*
Robert D. Croatti, A.B., *Associate Dean*
Lester W. McCullough, Jr., B.A., *Assistant Dean*
Kathleen M. Higgins, M.S., *Coordinator of Educational Services in Forensic Science*
Laurie A. Mulcahy, B.S., *Assistant to the Dean for Graduate Programs*

Professors

Romine R. Deming, Ph.D.
Edith E. Flynn, Ph.D.
James A. Fox, Ph.D.
George L. Kelling, Ph.D.
Nicole F. Rafter, Ph.D.
Robert Sheehan, M.A., D.Jur.
(Honorary)

Associate Professors

John H. Laub, Ph.D.
Wallace W. Sherwood, LL.M.
Paul E. Tracy, Ph.D.

Assistant Professors

Norman D. Bates, D.Jur.
Frank A. Schubert, D.Jur.

Degree Offered: Bachelor of Science

The College of Criminal Justice was founded to help prepare students to enter professions that deal with some of the most important issues of our times. To deal with these issues and to help prepare graduates for careers that are rewarding and beneficial, innovative methods and ideas, as well as the most advanced thinking, are used by the College. As a reflection of its significant role in higher education, the College has received substantial grants from the U.S. Department of Justice and was designated both as a training center in criminal justice and as a center of education and innovation in the field of criminal justice and forensic science.

Professional Preparation

The College offers its students the opportunity to prepare for professional careers in the fields of criminal justice and private security; through its prelegal studies concentration, many students also prepare for entry to law school. The curriculum has been designed to offer students a broad academic foundation upon which to base professional courses that introduce students to specific career areas. Legal studies, law enforcement, private security, corrections, probation and parole, juvenile delinquency, planning and evaluation, and forensic science are some of the areas of interest pursued by students. It is also expected that a number of graduates will choose advanced study in academic fields such as criminology, forensic science, social work, public administration, private security, and law, as well as in the entire area of criminal justice.

The Five-Year Program

The College of Criminal Justice offers a five-year academic program on the Cooperative Plan of Education, which allows a candidate for the baccalaureate degree to undertake a specialized program of study in one of four academic concentrations: security and crime prevention, law enforcement, corrections, and legal studies.

It is anticipated that co-op assignments may include work in parole or probation offices, law firms, police departments, private security agencies, public or private institutions, social and government agencies, prisons, planning and evaluation units, or other areas related to the criminal justice program.

Students are offered a broad educational background for future roles in criminal justice, private security, or law. Because students are preparing for careers involving the concerns and problems of people from all walks of life, course work in the social sciences, behavioral sciences, and the humanities is integrated with professional courses. The liberal content of the curriculum is highly desirable, not only for its value as a foundation upon which general intellectual development may be based but also for its value as an indispensable educational requirement for professional development.

Graduates must be prepared to judge objectively the many problems inherent in the administration of justice in contemporary American society. The College of Criminal Justice helps to prepare students for careers that will be not only personally productive and rewarding but intellectually stimulating as well.

Honors Program

The College of Criminal Justice participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

Graduation Requirements

Candidates for the bachelor of science degree must complete all the prescribed work of the curriculum, a total of 172 quarter hours of credit.

Students who undertake the Cooperative Education Program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

Graduation with Honors

Candidates who have achieved superior grades in their academic work will be graduated cum laude. Upon special vote of the faculty, a limited number of this group may be graduated magna cum laude or summa cum laude. Students must have been in attendance at the University for at least six academic quarters before they become eligible for honors at graduation.

Sample Freshman-Year Program

First Quarter	Second Quarter	Third Quarter
English	English	Western Civilization
Western Civilization	Foundations of Psychology I	Foundations of Psychology II
Introduction to Sociology	Introduction to Politics	Introduction to American Government
Introduction to Law and the Legal Process	Critical Issues in Criminal Justice and Criminology	Administration of Criminal Justice

In addition to the above courses, students may elect to take Basic ROTC.

Basic Course Requirements

I. General Requirements

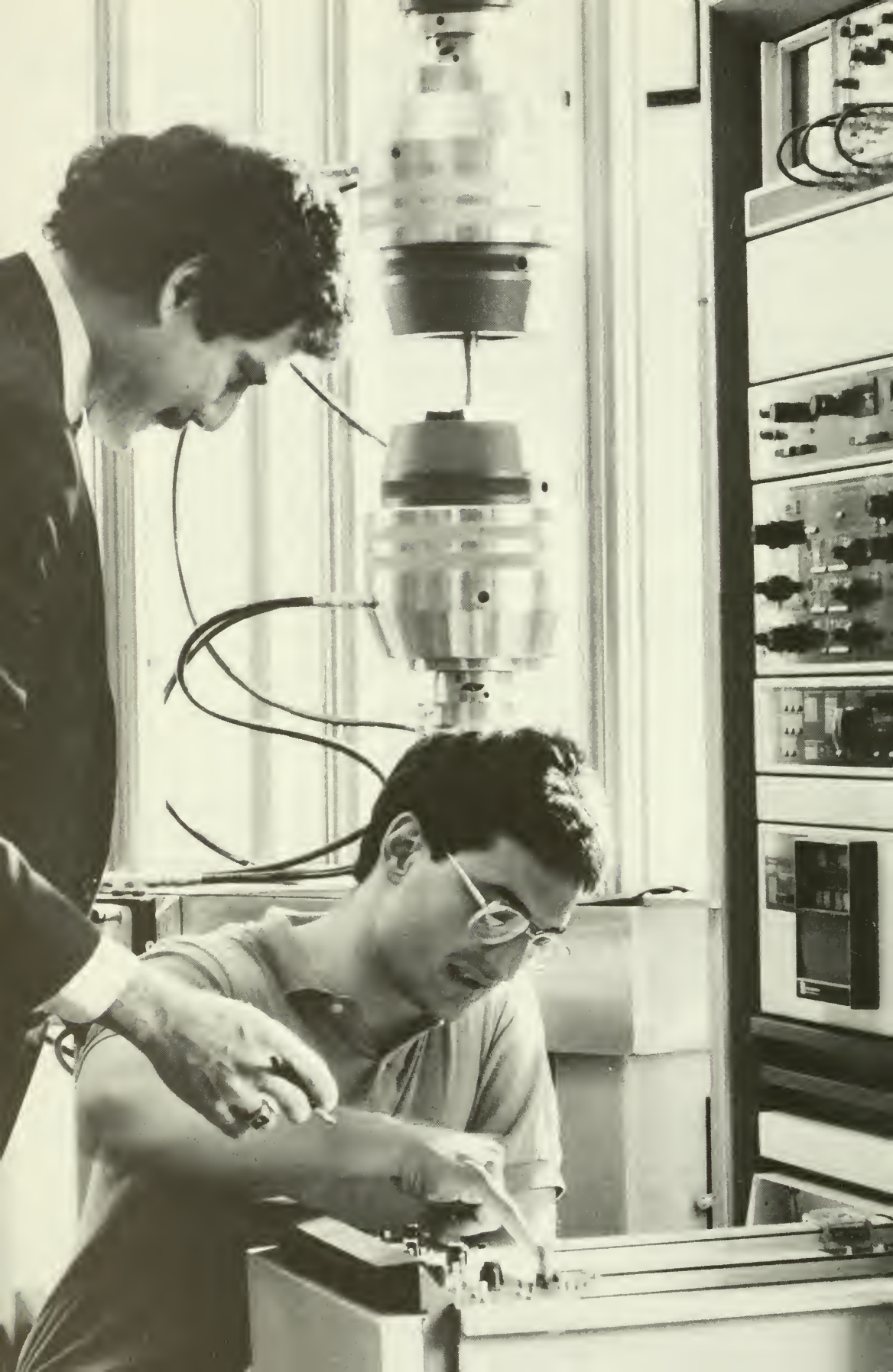
Course	Q.H.	Course	Q.H.
Principles and Problems of Economics	8	Freshman English II*	4
Introduction to Politics*	4	State and Local Government†	4
Introduction to American Government*	4	Western Civilization*	8
Foundations of Psychology I & II*	8	Science or Math†	8
Introduction to Sociology*	4	Middler-Year Writing Requirement	4
Freshman English I*	4	Non-criminal justice electives (11)	44

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Administration of Criminal Justice*	4	Criminology†	4
Critical Issues in Criminal Justice and Criminology*	4	Introduction to Criminal Law†	4
Introduction to Law and the Legal Process*	4	Criminal Due Process†	4
		Criminal Justice Research	4
		Criminal justice electives (9)	36

* Courses are usually taken in the freshman year.

† Courses are usually taken in the sophomore year.



Paul H. King, Ph.D., *Dean*

Richard J. Murphy, Ph.D., *Associate Dean*

David R. Freeman, Ph.D., *Associate Dean and Director of the Graduate School*

Arlene F. Becella, M.B.A., *Assistant Dean*

David C. Blackman, M.S., *Assistant Dean and Director of Minority Affairs*

Paula G. Leventman, Ph.D., *Assistant Dean and Director of Women in Engineering*

Ralph S. Blanchard, M.S., *Director of Part-Time B.S. Program*

The College of Engineering prepares students to contribute as professional engineers to the accumulation and application of new knowledge in a technologically changing world. Fundamentals are emphasized, thus offering students the opportunity to obtain the basic technical knowledge necessary to practice in a variety of positions.

The concept of education as a continuing, lifelong process necessary for effective professional work in an environment of steadily emerging new ideas, practices, and technologies underlies the structure of the engineering curriculum. At the same time, study of the social sciences and humanities provides an awareness of the social, economic, political, aesthetic, and philosophical influences that are part of the context in which students will practice their professions.

The overall objectives of the College of Engineering are that students:

1. understand the basic principles of the particular branch of engineering selected;
 2. develop and demonstrate competence in analysis and design appropriate to the engineering specialization;
 3. communicate effectively and reason clearly;
 4. acquire the motivation for continuing professional growth.
-

The Five-Year Program

The College of Engineering offers five-year cooperative education programs in chemical, civil, electrical, industrial, and mechanical engineering leading to the degree of bachelor of science with specification according to the engineering department in which the student qualifies. The College also offers a general engineering program, which leads to the awarding of an unspecified bachelor of science degree. Through this program students have the opportunity to design a curriculum suited to their objectives. The various curricula offer students the opportunity to prepare effectively for employment in industry or postgraduate study.

The freshman year is comprised of three quarters of full-time study. Courses in mathematics, physics, chemistry, and computers form the foundation on which the upperclass curricula are built.

Beginning in the second year, students progress through sequential engineering science courses to the advanced engineering courses specific to their major. These courses place a heavy emphasis on design.

About one-fifth of the upperclass curriculum is devoted to electives in the social sciences and humanities. These courses are designed to provide students with an appreciation of the culture and values of the society in which they will practice their professions. All degrees have the additional requirement that the student demonstrate proficiency in oral and written communication.

Cooperative work in the chosen branch of engineering begins upon completion of the freshman year and continues throughout the remaining upperclass years, alternating with periods of full-time study. The work assignments during this time may be most valuable in helping to integrate the important elements of both an engineering and a liberal arts education. They can also be instrumental in teaching the value of teamwork and, at the same time, helping the student to acquire insight into the problems of actual engineering practice.

Honors Program

The College of Engineering participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

Special Programs**Five-Year B.S.–M.S. Programs**

The electrical and computer engineering, industrial engineering and information systems, and mechanical engineering departments offer programs leading to both the bachelor's and master's degrees in five years. Students with outstanding academic records (3.0 or better) carry extra courses and, in the senior year, forego one cooperative work quarter in order to complete the course requirements for both degrees within five years.

Part-Time Program Offered During Evening Hours

The College of Engineering also offers a six-year, part-time curriculum leading to the degree of Bachelor of Science in Civil, Electrical, or Mechanical Engineering. Classes are held in the evening. Admission and course requirements are the same as for the five-year cooperative degree programs. For further information, consult the evening brochure of the College of Engineering.

Graduation Requirements

Candidates for the bachelor of science degree must complete all of the prescribed work of the curriculum in which they seek to qualify with no academic deficiencies. Students who undertake cooperative work assignments must complete a minimum of four

quarters of cooperative work experience approved by the Department of Cooperative Education.

Students transferring from another college or university are not eligible to receive the bachelor of science degree until they have completed at least one academic year at Northeastern University immediately preceding their graduation.

Graduation with Honors	Candidates who have attained superior grades in their academic work will be graduated cum laude. Upon special vote of the faculty, a limited number of this group may be graduated magna cum laude or summa cum laude. Students must have completed at least one hundred quarter hours of course work at Northeastern University before they may become eligible for honors at graduation.
Accreditation	All undergraduate day programs with specification, offered solely by the College of Engineering, as well as the part-time evening programs in civil, electrical, and mechanical engineering, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET).
Engineering Student Service Office	<p>The Engineering Student Service Office (ESSO), located in the Snell Building, Room 220, is the primary source of assistance for students in the College of Engineering.</p> <p>The office houses the records of all upperclass students. ESSO staff administratively handles transfer of credit petitions and assists students having problems related to study skills, academic difficulties, and choice of major or career. Freshman records are kept by the Freshman Affairs Office. Counselors in that office assist freshmen with transfer credit petitions and other matters where records are needed. However, as students in the College of Engineering, freshmen are welcomed and encouraged to take advantage of the services and programs of the ESSO.</p>
Women in Engineering	<p>More women are entering the field of engineering each year as career opportunities expand. Industry and government, now aware of the largely untapped pool of qualified women, are eager to provide positions for competent women engineers. Any woman with scientific or technical interests and aptitude should consider the many advantages of an engineering education.</p> <p>Approximately four hundred undergraduate women are currently enrolled in the College. The Women in Engineering program office maintains an interactive data base for academic support and networking. An active chapter of the Society of Women Engineers offers a full schedule of technical, professional and social programs.</p>

Minorities in Engineering	Through the Northeastern University Progress in Minorities in Engineering (NUPRIME) program, the college seeks to expand educational opportunities for qualified blacks, Puerto Ricans, Mexican-Americans, and Native Americans. It provides scholarships based on merit or need. Every effort is made to provide enough aid so that outside work is not necessary during the freshman year. Advising and tutorial services are among the support services provided by the program.
Computer Facilities	The College provides students with ample computer facilities to support coursework and research activities. These facilities include a Digital VAX 11/785 system with 32 student terminals; a Data General MV/8000 with 30 student terminals; a Computer-vision Computer-Aided Design and Manufacturing (CAD/CAM) system with 8 advanced workstations; and 25 IBM XTs in a local area network to support computer graphics and design courses. In addition, the engineering departments provide a variety of mini- and micro-computer facilities to support special coursework and research and the University computer center provides 60 terminals for two VAX 11/780s and 170 networked IBM PCs for student use.

Sample Freshman-Year Program

The freshman-year program of studies in the College of Engineering is the same for all designated majors in the College.

First Quarter Computers for Engineers Calculus Physics English II	Second Quarter Engineering Graphics and Design Calculus Physics General Chemistry	Third Quarter Calculus Physics General Chemistry Great Themes in Literature
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In addition to the above courses, students may elect to take Basic Reserve Officer Training Corps (ROTC). Chemical engineering majors are required to take a general chemistry laboratory course along with the required general chemistry course.
Middler-Year Writing Requirement: College of Engineering students will complete the Middler-Year Writing Requirement as follows: Chemical Engineering students will take either Technical Writing (ENG 1125) or a one-credit Writing Workshop (ENG 1340); Civil Engineering students will take Technical Writing (ENG 1125); Electrical Engineering students will take a one-credit Writing Workshop (ENG 1340); Industrial Engineering students will take Technical Writing (ENG 1125); and Mechanical Engineering students will take a one-credit Writing Workshop (ENG 1340).

Department of Chemical Engineering

Professor

John A. Williams, Ph.D.

Associate Professors

Ralph A. Buonopane, Ph.D.

Bernard M. Goodwin, Sc.D.

Richard R. Stewart, Ph.D.

Assistant Professor

Ronald J. Willey, Ph.D.

Lecturers

Georges A. Melhem, M.S.

Mustafizur Rahman, M.S.

Degree Offered: Bachelor of Science in Chemical Engineering

Chemical engineering involves the design, construction, operation, and management of processes in which materials essential to society are produced. The goal of the chemical engineer is to develop processes which use resources most efficiently, economically, and safely in an environmentally sound manner.

Since the field of chemical engineering is so varied, the program of study has been designed to offer broad training in which fundamental principles are stressed, providing students with the strong background needed to acclimate themselves readily to graduate school or to an industry of their choice. The basic scientific and engineering knowledge in the program provides the graduate with the skills needed to respond to rapidly changing technologies in the future.

Description of Chemical Engineering

The chemical engineer has been defined as a "professional experienced in the design, construction, and operation of plants in which materials undergo chemical and physical change." It is the task of the chemical engineer to reduce the costs, increase the production, improve the quality of existing products, and develop new products. Chemical engineering has grown out of discoveries in chemical laboratories which have served as a foundation for a great many new industries whose production processes involve chemical as well as physical changes.

The petrochemical, biomedical, pharmaceutical, agricultural chemicals, food processing, plastics and synthetic fibers, energy and synthetic fuels, and waste management areas require men and women trained in chemistry as well as in engineering. Many older industries such as pulp and paper, metals and glass production, paints and coatings, textiles and electroplating are also employing

chemical engineers. Computerized process controls are being designed to improve the efficiency of older plants and computer-aided design of new plants is becoming increasingly common.

The Five-Year Program

The essential background for chemical engineers is derived from the fundamental courses in chemistry, mathematics, and physics, required of all engineering students. Students then go on to advanced courses which apply these fundamentals to the solution of engineering problems. These upperclass courses skillfully blend the latest mathematical and theoretical analyses with the practical aspects of the profession. Students are provided the opportunity to pursue specialized career interests through minors, such as a minor in biology, and through technical electives.

Laboratories

Selected courses in the curriculum contain laboratory sessions that supplement the presentation of material in lectures. These sessions are devoted to practice in problem formulation and solution, including the use of computers and standard software packages. The senior course in process design is largely taught in laboratory sessions, with major emphasis on computer-aided design and simulation.

The research laboratories are designed to acquaint the student with the experimental approach to the solution of engineering problems and to develop research interests.

Students are first exposed to the basic measurements in engineering in experimental methods laboratories, with emphasis on temperature, pressure, and flow rate. Following this, they are given problems involving such areas as transport properties, kinetics, thermodynamics, and process dynamics, which they must solve experimentally. They are required to design and conduct the experiment, reduce the data using computers, and write a final report. Students use pilot-scale chemical engineering equipment in the experiment, when applicable.

Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English	8	Computers for Engineers	4
General Chemistry	8	Mathematical Analysis	4
Chemistry Lab	1	Economics	4
Physics	16	Social science/humanities	16
Physics Lab	2	electives	
Calculus	20		
Engineering Graphics and Design	4		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	Heat Transport	4
Organic Chemistry	8	Separation Processes	4
Physical Chemistry	10	Chemical Engineering Economics	4
Chemical Engineering Calculations	8	Advanced chemistry elective	4
Computation Laboratory	2	Engineering elective	4
Chemical Engineering Thermodynamics	8	Process Control	4
Experimental Methods	8	Process Design	12
Chemical Engineering Kinetics	4	Chemical engineering electives	12
Momentum Transport	4		

Department of Civil Engineering

Mishac K. Yegian, Ph.D., *Professor and Chairman*

Professors

Reginald L. Amory, Ph.D.
Frederic C. Blanc, Ph.D.
John J. Cochrane, Ph.D.
Constantine J. Gregory, Ph.D.
Paul H. King, Ph.D.
Kenneth M. Leet, Sc.D.

Assistant Professors

Peter G. Furth, Ph.D.
Fadi A. Karaa, Ph.D.
Eugene A. Marciano, Ph.D.

Associate Professors

Leroy M. Cahoon, M.S.
Menashi D. Cohen, Ph.D.
Walter E. Jaworski, Ph.D.
Michael Kupferman, Ph.D.
Robert L. Meserve, M.S.
John G. Schoon, Ph.D.
Richard J. Scranton, M.S.
Irvine W. Wei, Ph.D.

Degree Offered: Bachelor of Science in Civil Engineering

A major aim of the Civil Engineering Department is to provide students with the opportunity to acquire a fundamental, flexible, yet rigorous engineering education so that, in view of inevitable change within the field, graduates will be in a position to build continuously on their basic knowledge. A wide range of electives in the humanities, social sciences, and basic sciences encourages students to investigate areas outside their specific technical focus and to extend their personal interests and involvements.

Description of Civil Engineering

Civil Engineering is the profession in which a knowledge of the mathematical and physical sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize,

economically, the materials and forces of nature for the progressive well-being of mankind. Civil engineers improve and protect the environment; provide facilities for community living, industry, and transportation; and provide structures for the use of mankind. The buildings people live and work in, transportation systems, city and town services, water supply—all reflect creative planning and application of engineering principles on the part of civil engineers.

Civil engineers measure and map the earth's surface and utilize these maps to locate their projects. They design and supervise the construction of bridges, tunnels, buildings, dams, and aqueducts. They build supporting foundations for these and other structures. Civil engineers plan, design, construct, and maintain highways, railroads, canals, and airports. They regulate rivers and control floods; build docks, pipelines, sea walls; develop harbors; design and build plants and systems to bring pure water to homes and factories; design and build systems for sewage and refuse disposal; drain swamps and irrigate arid areas.

The Five-Year Program

The five-year civil engineering curriculum is divided into eleven quarters of school and eight quarters of cooperative work assignments. The work phase is designed to allow the student to gain insight into all types of activity normally confronted by the civil engineer. Thus, the well-motivated student can determine from these work experiences what further course work preparation will be required to become successful as a practicing civil engineer.

The curriculum is intended to offer a firm educational background for students preparing for a career in the planning, design, and construction of structures, transportation systems, and environmental systems as civil engineers.

The first years of the curriculum are, for the most part, devoted to the fundamentals of math, basic sciences, and engineering that comprise the foundation for later professional studies. The final years are devoted to a range of professional subjects, both required and elective. Guidance from a faculty adviser is available throughout the academic program.

**Part-Time Program Offered
During Evening Hours**

The Department of Civil Engineering also offers a six-year, part-time curriculum leading to the degree of Bachelor of Science in Civil Engineering. Classes are held in the evening. Admission and course requirements are essentially the same as for the five-year cooperative degree program.

Student Professional Society

Northeastern's student chapter of the American Society of Civil Engineers is a very active and professional organization and participation in its activities has proven to be a unique complement to Northeastern's traditional classroom and co-op experience. In addition to traditional activities, which include sponsoring a weekly professional lecture series and occasional field trips to civil

engineering construction sites and constructed facilities, during the past ten years members have successfully completed several significant community-service projects valued at approximately a quarter of a million dollars.

The students have developed and designed innovative and educational outdoor play exhibits illustrating both natural and man-made phenomena for the Children's Museum of Boston. They have worked with staff members of the Joseph P. Kennedy, Jr., Memorial Hospital for Children in the planning, design, financing, and construction of a special playground for handicapped children. They have designed and constructed an outdoor amphitheater for the Salvation Army's Camp Wonderland, and performed an investigation of fire evacuation procedures and building modifications for the Cotting School for the Handicapped. The students have designed and constructed a play-therapy center for Boston Children's Services Association and a unique play area for the Language and Cognitive Development Center. They financed, designed, and constructed a children's group therapy facility with indoor and outdoor components for the Brookline Mental Health Clinic. Last year, student chapter members financed, designed, and constructed an innovative playground for the Colonel Daniel Marr Boys and Girls Club of Dorchester. Each year, at least one such community-service project is undertaken.

In recognition of these unusual efforts, our student chapter has been designated as the "single most outstanding" chapter in the nation and consequently has received the Robert Ridgway Award of the American Society of Civil Engineers for an unprecedented seven out of the last nine years.

Department Facilities

Computer Facilities

The Civil Engineering Department uses a variety of computer facilities to complement course work and research. The department has two minicomputers (a Hewlett-Packard System 45 with interactive graphics and a Digital LSI-11) for laboratory data acquisition. In addition, the department also has a microcomputer facility consisting of IBM personal computers, printers, and plotters. All systems are supported with sophisticated software packages with applications to all disciplines of civil engineering.

Laboratories

The department laboratories provide state-of-the-art equipment for research and teaching in soil mechanics, materials, structures, transportation, hydraulics, water quality, air pollution, environmental chemistry, microbiology, and unit operations. In addition,

there are special project laboratories and three controlled environment rooms. Included in the laboratories is sophisticated equipment including atomic absorption spectrophotometers, a gas chromatograph, a total carbon analyzer, a shaker table, triaxial and consolidation equipment, and structural testing machines.

Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English	8	Chemistry	8
Calculus	20	Economics	4
Computers for Engineers	4	Mathematics	4
Engineering Graphics and Design	4	Social science/humanities electives	12
Physics	16	General elective	4
Physics Lab	2		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	Soil Mechanics (w/ lab)	6
Computer Applications in Civil Engineering	4	Electrical Engineering	4
Structural Mechanics	8	Applied Probability Theory	4
Fluid Mechanics	4	Steel Design I	4
Engineering Economy	4	Dynamics	4
Structural Analysis (w/ lab)	6	Materials (w/ lab)	6
Environmental Engineering I	4	Concrete Design I	4
		Engineering Measurements (w/ lab)	6

Technical Electives

The Department of Civil Engineering offers a wide variety of technical electives. These enable students to coordinate elective choices to satisfy their personal career objectives.

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Thermodynamics	4	Civil Engineering Systems	4
Hydraulic Engineering	4	Transportation Analysis	4
Structural Mechanics III	4	Construction Engineering	4
Structural Analysis II	4	Steel Design II	4
Structural Analysis III	4	Foundation Engineering	4
Concrete Design II	4	Environmental Design	4
Geotechnology	4	Air Pollution	4
Environmental Engineering II	4	Highway Engineering	4
Environmental & Hydraulics Lab	4		
Legal Aspects of Civil Engineering	4		

Department of Electrical and Computer Engineering

John G. Proakis, Ph.D., *Professor and Chairman,*
William Lincoln Smith Chair

Professors

Ladislav Dolansky, Ph.D.
James M. Feldman, Ph.D.
Arvin Grabel, Sc.D.
Richard E. Grojean, M.S.
Sarma S. Mulukutla, Ph.D.
Harold R. Raemer, Ph.D.
Wilfred Remillard, Ph.D.
J. Spencer Rochefort, M.S.
Sheldon S. Sandler, Ph.D.
Martin E. Schetzen, Sc.D.
Walter C. Schwab, Ph.D.
Philip E. Serafim, Sc.D.
Michael B. Silevitch, Ph.D.
Robert D. Stuart, Ph.D.
Carmine Vittoria, Ph.D.

Associate Professors

Marcello J. Carrabes, M.S.
John R. Deller, Jr., Ph.D.
J. Duncan Glover, Ph.D.
Sheila Hinchey, Ph.D.
Wayne G. Kellner, Sc.D.
Walter H. Lob, M.S.
Robert N. Martin, M.S.
Charles T. Retter, Ph.D.

Assistant Professors

Elizabeth E. Ames, Ph.D.
Chung Chan, Ph.D.
Vinaykumar Ingle, Ph.D.
Francis Kai, Ph.D.
Catherine Keller, Ph.D.
Dimitris Manolakis, Ph.D.
Lazaros Merakos, Ph.D.
Chu Whan Moon, Ph.D.
Chrysostomos Nikias, Ph.D.
Ramachandran Raghavan, Ph.D.
Bahram Shafai, Sc.D.
Chai-Chi Tsui, Ph.D.
Kimon Valavanis, Ph.D.
Mahmoud Wagdy, Ph.D.

Lecturers

Robert Angus, M.S.
Chi-Kin Chow, M.S.
Prawat Nagvajara, M.S.
Fred Nohmer, M.S.
Kevin Paul, M.S.
Amar Singh, Ph.D.
Ta Siu, M.S.

Degree Offered: Bachelor of Science in Electrical Engineering

Among their many achievements, electrical engineers have been primarily responsible for the development of the computer, integrated circuits, the pacemaker, satellite communication, space navigation, microprocessors, television, and the means of providing the energy needed to run our cities and our industries. At present, electrical engineers are working to help find solutions to the problems of information transfer and management, industrial productivity, energy conservation and alternative energy sources, transportation, and health care.

Description of Electrical Engineering

Despite the diversity of its applications, electrical engineering may be conveniently divided into two broad, general areas of information sciences and energy resources. The area of information sciences is concerned primarily with systems whose function is

computation, communication, or control. Included in this area are the circuits and devices that comprise the systems and the application of the systems and engineering techniques to other disciplines. Energy resources deal with problems related to the sources, generation, and distribution of large quantities of electrical energy. It should be noted, however, that no rigid boundary exists between the two areas, and many of the technical specialties within electrical engineering are applicable to both areas.

Many electrical engineers are involved with the more traditional activities of system design and development, such as the information sciences or energy resources areas. Other electrical engineers apply the knowledge gained in their professional education to such disciplines as ocean exploration, meteorology, experimental psychology, electronic music, health-care systems, bioelectronics, and educational devices for the disadvantaged.

The optimistic outlook for electrical engineering is based on the breadth of the technical activity described above. We are constantly reminded that among the pressing problems in our society are improvement of industrial productivity, the energy crisis, data communication and management, urban transportation, health care, and the plight of the socially and physically disadvantaged.

No one has yet been able to forecast how these problems will be solved without the use of technological resources. Readily available electrical energy, data processing, electronic instrumentation and control, and communication are among the crucial resources needed.

The Five-Year Program

The purpose of the curriculum is to offer the student an education that has the breadth and depth necessary for professional practice. Breadth is needed to give the student an awareness of all that electrical engineering encompasses and to provide the necessary background for independent study, a major criterion for professional success. Individual career objectives and initial professional achievement can result, in part, from learning a subject area in some depth. To achieve the balance between depth and breadth, the curriculum is divided into the *core program* and *elective courses*.

The core program includes those courses with content applicable to all specialties in electrical engineering and offers students a basic background for future learning. Subject areas covered in the core program include:

1. Circuits and systems
2. Electronic devices and circuits
3. Digital computer design
4. Electromagnetic theory
5. Electromechanical dynamics (energy conversion)
6. Electrical measurements (laboratories)

The elective courses are designed to permit students to develop their own interests. Many students use this part of the program to learn a particular subject in depth and to better prepare for graduate studies. A broad range of courses is offered, including Digital Computer Architecture, Software Engineering, Robotics, Communication Systems, Control Systems, Advanced Electronics, Solid-state Devices, Power Systems, Wave Propagation and Distributed Circuits, Network Theory, and Mathematical Techniques.

In addition, students who wish to conduct individual projects or learn about a subject area not offered in an elective course may enroll in the senior project course and work with an interested faculty adviser on a one-to-one basis.

Five-Year B.S.–M.S.

The Electrical and Computer Engineering Department offers a program leading to both the bachelor's and master's degrees in five years. Students with outstanding academic records (3.0 or better) carry extra courses and, in the senior year, forego one co-operative work quarter in order to complete the course requirements for both degrees within five years.

Option in Power Systems Engineering

The power systems engineering program is a special option for those electrical engineering students who wish to specialize in energy resources. This program is conducted in cooperation with the electric power companies in New England and other eastern states.

Option in Computer Engineering

The option in computer engineering is a special option for those electrical engineering students who wish to specialize in the design of digital computers and their integration within larger systems for communications, resource management, and automatic control.

In the design of a digital processing system, hardware and software must be considered as an integrated entity—software cannot be separated from hardware considerations. Thus, the computer engineer must be both a capable programmer and a capable hardware designer. The collective demands of computer engineering plus traditional electrical engineering encompass more knowledge than can be included in a single, highly structured degree program. The solution at Northeastern, as at many other schools, was to adopt a new undergraduate option within the Department of Electrical and Computer Engineering. The objective of this option is to provide the student with a basic and comprehensive knowledge of the principles that underlie the organization, design, and applications of digital processing systems. It encompasses both the hardware and software design aspects of the system and offers students the opportunity to acquire an understanding of the important relationships and “trade-offs” between the hardware

and software components of a digital system. This understanding is necessary in order to create computer systems that satisfy the users' needs at prices they can afford.

Part-Time Program Offered During Evening Hours

The Electrical and Computer Engineering Department also offers a six-year, part-time curriculum leading to the degree of Bachelor of Science in Electrical Engineering. Classes are held in the evening. Admission and course requirements are essentially the same as for the five-year cooperative degree programs.

Laboratories

The seven laboratory courses included in the program are an integral part of the educational process. Their purpose is both to supplement concepts developed in core courses and to introduce the student to design and experimental techniques.

To provide this facet of the educational experience, the department has laboratory equipment in excess of \$2.5 million. In addition to standard professional laboratory equipment, several specialized laboratory facilities are maintained. These include several small digital computers, personal computers, a number of CRT terminals, and a variety of microprocessors. Programming courses and research programs also use the large computer systems of the College of Engineering and the University.

Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Calculus	16	Computers for Engineers	4
Physics	16	Engineering Graphics and Design	4
Physics Lab	2	Mathematical Analysis	4
General Chemistry	8	Social science/humanities electives	24
English	8		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Writing Workshop	1	Electronics I & II	8
Circuits and Systems I, II, and III	12	Electronic Design I	4
Linear Systems Analysis I and II	8	Field Theory I & II	8
Thermodynamics or Material Science	4	Fields and Energy Conversion	4
Mechanics	4	Probability	4
Electrical Engineering Lab	8	Communication Systems	4
		Technical electives	20
		Computer Engineering	12

Technical Electives

The Department of Electrical and Computer Engineering offers a wide variety of technical electives. These enable students to coordinate elective choices to satisfy their personal objectives. To aid in selection, the elective courses are grouped by discipline.

Electronic Circuits and Systems

Theory & Technology of Semiconductor Devices I & II

Senior Project Labs

Control Systems

Communication Theory

Numerical Methods & Computer Applications

Digital Techniques

Topics in Integrated Circuit Design

Electromagnetic Theory

Wave Transmission & Reception

Advanced Topics in Electromagnetic Field Theory

Numerical Methods & Computer Applications

Theory & Technology of Semiconductor Devices I & II

Senior Project Labs

Computer Engineering

Numerical Methods & Computer Applications

Digital Techniques

Computer Engineering I, II, III, and IV

Topics in Integrated Circuit Design

Communication Theory

Control Systems

Applied Discrete Analysis

Machine & Assembly Language Programming

Senior project labs

Systems Theory

Control Systems

Communication Theory

Numerical Methods & Computer Applications

Digital Techniques

Power Systems I & II

Wave Transmission & Reception

Senior project labs

Power Systems Option Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>
Same as general requirements on page 172.	

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Writing Workshop	1	Transients in Power Systems	4
Circuits and Systems I, II, and III	12	Mechanics	4
Linear Systems I and II	8	Electric Machines	8
Thermodynamics	8	Electric Power Systems	8
Electrical Engineering Lab	5	Electrical Engineering Power Lab.	3
Electronics I & II	8	Electronic Design	4
Field Theory I & II	8	Computer Engineering	8
Fields and Energy Conversions	4	Probability	4

Computer Engineering Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>
Same as general requirements on page 172.	

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Writing Workshop	1	Computer Engineering I-IV	16
Circuits & Systems I, II, and III	12	Field Theory I & II	8
Linear Systems I and II	8	Fields and Energy Conversion	4
Electronics I & II	8	Communication Systems	4
Electronic Design I	4	Physical Electronics	4
Thermodynamics or Material Science	4	Topics in Integrated Design	4
Mechanics	4	Technical electives	8
Electrical Engineering Lab	8		

Department of Industrial Engineering and Information Systems

Thomas P. Cullinane, Ph.D., *Professor and Chairman*

Professors

David R. Freeman, Ph.D.
Ronald R. Mourant, Ph.D.
Wilfred P. Rule, M.S.

Associate Professors

Franklyn K. Brown, M.S.
Surendra M. Gupta, Ph.D.
Carolyn D. Heising, Ph.D.
Stewart V. Hoover, Ph.D.
Thomas E. Hulbert, M.S.
Mieczyslaw M. Kokar, Ph.D.
Emanuel S. Melachrinoudis, Ph.D.
Ronald F. Perry, Ph.D.
Kenneth S. Woodard, M.S.

Assistant Professors

Martin Gardiner, Ph.D.
Henry H. K. Kung, Ph.D.
David Rumpf, Ph.D.
Gerard Volland, M.S.

Degree Offered: Bachelor of Science in Industrial Engineering

Industrial engineers are problem solvers. Industrial management needs factual information that defines the consequences of alternative decisions. The industrial engineer collects this information and evaluates alternatives to make the decision that best achieves a particular organizational goal. The scope of decisions may involve the entire organization or some portion of it associated with a given product or service.

Description of Industrial Engineering

As a problem solver, the industrial engineer is concerned with complex man-machine systems that require a knowledge of engineering fundamentals. Also, since industrial engineers are often employed as managers, students are instructed in economics and corporate organization so that they can make informed managerial decisions. In addition, they are made aware of the relationship between human needs and the the work environment through courses in work analysis and human factors.

The Five-Year Program

The program of study offered by the Department of Industrial Engineering and Information Systems emphasizes the current developments in industrial engineering: computer/information and industrial/manufacturing systems. Computer-based applications are an integral part of a number of courses in the program, including Probability and Statistics, Operations Research, Simulation, and Engineering Economy and Work Design. In addition, students gain hands-on experience through their technical courses involving the micro-processor and integrated manufacturing laboratories.

Five-Year B.S.–M.S. Program	The Department of Industrial Engineering and Information Systems offers a program leading to both the bachelor's and master's degrees in five years. Students with outstanding records (3.0 or better) carry extra courses and, in the senior year, forego one co-operative work quarter in order to complete the course requirements for both degrees within five years.
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Laboratories	<p>Human Factors Laboratory Equipped with sophisticated workstations for experimentation in perception, this facility is used for research, demonstration, and student projects.</p> <p>Computer Laboratory Numerous microcomputers provide an opportunity for students to gain experience in applying software utilities to actual engineering problems. The department has a large collection of industrial engineering software available for student use.</p> <p>Microprocessor Laboratory This laboratory has microprocessors available for hands-on machine programming and microprocessor networking. Two local area networks of 16-bit microprocessors permit students to perform a variety of experiments in communication.</p> <p>Manufacturing Laboratory Students simulate an automated factory with the use of a master minicomputer, programmable microprocessors, a robot, and conveyor belt integrated for manufacturing system experimentation.</p>
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Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Calculus	12	Computers for Engineers	4
Physics	16	Economics I & II	8
Physics Lab	2	Mathematical Analysis	4
General Chemistry	8	Social science/humanities	
English	8	electives	8
Engineering Graphics and Design	4	Behavioral science electives	8
		Open elective	4

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	People and Organizations	4
Work Design	4	Principles of Computation and Programming I	4
Statics	4	Engineering Economy and Statistical Decision Theory	4
Electrical Engineering I	4	Engineering science electives	8
Probabilistic Analysis	4	Technical electives	16
Statistics I & II	8	Design project	4
Production and Inventory Control	4		
Operations Research	8		
Systems Analysis	4		
Simulation	4		

Engineering Science Electives

Dynamics
Materials Science
Thermodynamics
Fluid Dynamics
Electrical Engineering II

Technical Electives

The Department of Industrial Engineering and Information Systems offers a wide variety of technical electives. These enable students to coordinate elective choices to satisfy their personal objectives.

Reliability and Quality Control
Manufacturing Automation
Microprocessor Applications
Human Considerations in Engineering Design
Human Factors
Management Information Systems
Facilities Design
Material Handling System Design

Department of Mechanical Engineering

Charles A. Berg, Sc.D., *Professor and Chairman*

Professors

George G. Adams, Ph.D.
John W. Cipolla, Jr., Ph.D.
John F. Dunn, Sc.D.
Arthur R. Foster, M.Engr.
Alexander M. Gorlov, Ph.D.
Richard J. Murphy, Ph.D.
Welville B. Nowak, Ph.D.,
D. Smith Professor of
Engineering
John N. Rossettos, Ph.D.
John Zotos, Met. Engr.

Associate Professors

Ralph S. Blanchard, M.S.
Hamid Nayeb Hashemi, Ph.D.
Thomas E. Kenny, Ph.D.
Gregory J. Kowalski, Ph.D.
Bertram S. Long, M.Engr.
Mohamad Metghalchi, Ph.D.
Uichiro Narusawa, Ph.D.
Yaman Yener, Ph.D.
Alvin J. Yorra, M.S.
Ibrahim Zeid, Ph.D.

Assistant Professors

Robert L. Sullivan, Jr., M.S.
Mohammad E. Taslim, Ph.D.
Wego Wang, Sc.D.

Lecturers

Constantine Fountzoulis, M.S.
Guido Lopez, M.S.
Jonathan Maher, M.S.
Luis Paz, M.S.
Mohammad Shaikhdavoud,
M.S.
Mansour Zenouzi, M.S.

Degree offered: Bachelor of Science in Mechanical Engineering

Mechanical engineering is the branch of science broadly concerned with energy, including its transformation from one form to another, its transmission, and its utilization. Mechanical engineers conceive, plan, design, and direct the manufacture, distribution, and operation of a wide variety of devices, machines, and systems—including complex man-machine systems—for energy conversion, environmental control, materials processing, transportation, materials handling, prosthetics, manufacturing, and the field of consumer products.

Description of Mechanical Engineering

The rapid technological advances of the past four decades have considerably expanded the mechanical engineer's sphere of inquiry and influence. These new areas of inquiry have placed the mechanical engineer in contact with such diverse disciplines as nuclear and solid-state physics, quantum mechanics, plasma physics, chemical kinetics, magneto-hydrodynamics, and rarefied gas dynamics, to name a few.

Mechanical engineers are engaged in all the engineering functions, including creative design, applied research, development, production, and management. The field of mechanical engineering is broad, providing an excellent professional base for career choice and interdisciplinary activities.

The Five-Year Program

In the first three years, students have the opportunity to learn the basic sciences (mathematics, physics, and chemistry), the engineering sciences (mechanics, thermodynamics, fluid mechanics, and material science), and the humanities. As upperclassmen, they may choose to concentrate their studies in the areas of thermo-fluid engineering, mechanics and design, or materials science and engineering.

Thermofluid engineering is concerned with the properties and characteristics of the working fluid of machines. For example, the ability of an aircraft to fly depends upon the manner in which air flows over its lifting surfaces. The energy to run a turbine is extracted from the steam or combustion gases that pass through it. The engineer must understand and have a knowledge of the concepts of thermodynamics. The efficiency of a cooling tower depends upon the mechanisms by which fluids transfer heat to surfaces, so the engineer must have a firm grasp of the principles of heat transfer.

Mechanics and design are based upon the fundamental scientific and mathematical tools utilized in the analysis of mechanical configurations as they evolve in the design of machines and power-producing devices. For example, the engineer in the area of mechanics and design may analyze and design structural components for power plants and deep-sea oceanographic vessels or develop new methods for evaluating filamentary composite structures. In the modern machine-tool industry, engineers may be concerned with computer control of machine tools; in the engine industry, they may analyze stresses in components such as turbine blades.

To prepare for such challenges, upperclass students have the opportunity to expand their basic knowledge by selecting courses such as Intermediate Strength of Materials, Vibrations, Systems Analysis and Control, Engineering Analysis, Design Fundamentals, and Computer-Aided Design.

Materials science and engineering is concerned with relationships among the structure, composition, properties, and functions of materials and with control of the structure and composition to achieve desired properties. Only recently have engineers come to realize that an understanding of the principles of materials science enables them to design more creatively and with greater freedom than the traditional reference to handbooks. Examples of areas in which mechanical engineers find materials properties a part of the basic design function include: manufacturing techniques, structures (vehicles, buildings), energy conversion, electronic devices (including computers), packaging, and prosthetic devices. Advanced courses are available for those mechanical engineers who desire further knowledge in the materials field.

Five-Year B.S.–M.S. Program

The Department of Mechanical Engineering offers a program leading to both the bachelor's and master's degrees in five years. Students with outstanding academic records (3.0 or better) carry extra courses and, in their senior year, forego one cooperative work quarter in order to complete the course requirements for both degrees within five years.

Part-time Program Offered in Evening Hours

The department also offers a six-year, part-time curriculum leading to the Bachelor of Science in Mechanical Engineering. Classes are held in the evening. Admissions and course requirements are essentially the same as for the five-year cooperative degree programs.

Laboratories

The laboratories in Mechanical Engineering contain equipment ranging from an electron microscope and ultrasonic measuring devices to pumps and weirs. Students working on thermofluids projects may use a turbine, various types of engines, thermoelectric coolers and generators, and a supersonic wind tunnel, to

name a few. A material science laboratory provides research microscopes, various furnaces, a fluid-to-fluid extrusion press, X-ray diffraction equipment, electron microscope, and other related equipment. For the mechanics and design areas, vibrations, experimental stress analysis, and materials testing facilities are provided.

Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English	8	Physics	16
General Chemistry	8	Physics Lab	2
Computers for Engineers	4	Mathematical Analysis	8
Engineering Graphics and Design	4	Social science/humanities electives	20
Calculus	20	Economics	4

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Writing Workshop	1	Measurement & Analysis	4
Statics	4	Fluid Mechanics	4
Dynamics I & II	8	Materials Science	5
Strength of Materials I & II	8	Design	16
Thermodynamics I & II	8	Electrical Engineering	4
Heat Transfer	4	Research report	1

Six additional technical courses are taken by juniors and seniors plus four social science/humanities electives. Technical elective offerings are subject to some departmental restrictions. Students should obtain the latest departmental booklet describing these restrictions and current course offerings.

Department of Biomedical Engineering

Samuel Fine, S.M., M.D., *Professor and Chairman*

Associate Professor

H. Frederick Bowman, Ph.D.

Degree Offered: Degree in one of the several engineering disciplines.

Biomedical engineering is concerned with bringing the engineering approach of analysis, design, invention, and manufacturing to problems of biological and medical significance.

Biomedical engineers are engaged in both theoretical and experimental studies either as independent investigators or as members of a research or development group. They may characterize and determine the mechanism of action of natural and synthetic macromolecules, analyze the properties of blood, and/or investigate the structure and function of such organ systems as the nervous system, the respiratory system, the cardiovascular system, or the endocrine system. They may design, develop, market and apply transducers, cardiac pacemakers and defibrillators, heart-assist systems, artificial kidneys and limbs, or diagnostic and therapeutic X-ray equipment. They are important members of the hospital health team.

Participation in an educational program involving the physical and biological sciences offers a sound foundation for future work toward a doctorate in medicine or dentistry, a career in biomedical engineering, or a career as an engineer in a hospital or a government agency such as the U.S. Department of Health and Human Services, depending upon such factors as the state of the economy and the student's own industry and overall ability. Industrial organizations, particularly those in the health-care industry, may be seeking individuals with a strong background in engineering supplemented by a biological science education. Other career opportunities may include public health, the psychological sciences, and the marine sciences.

Description of Biomedical Engineering

There is no special curriculum in biomedical engineering. Several engineering disciplines help provide the engineer with a technical background sufficient for a career in this field. The purpose of the Department of Biomedical Engineering is to assist the engineering student, from the freshman year through the senior year, to choose appropriate courses in the biological sciences that will complement those in the physical and engineering sciences and humanities taken in the standard engineering curriculum.

The student pursues a degree in an engineering discipline chosen in consultation with the biomedical engineering adviser. The life science courses selected may be taken as part of his engineering degree or, in part, as additional courses. Engineering graphics and design in the freshman year is replaced by a biology course for biomedical students. The opportunity to take these courses is dependent on the student's interests, capabilities, and academic record. It is, of course, limited by possible schedule conflicts.

Students who wish to take an engineering program that includes biological sciences must contact the Department of Biomedical Engineering immediately upon their arrival as freshmen at the University so that a proper freshman schedule can be arranged.

General Engineering Program

Advisory Committee for 1986–1987

Richard J. Murphy, Ph.D., *Associate Dean, Chairman*

Arvin Grabel, Sc.D., *Electrical Engineering*

Richard J. Scranton, M.S., *Civil Engineering*

Richard R. Stewart, Ph.D., *Chemical Engineering*

Alvin Yorra, M.S., *Mechanical Engineering*

Ronald F. Perry, Ph.D., *Industrial Engineering*

Degree Offered: Bachelor of Science

Engineering and technology influence virtually all areas of endeavor and have a profound effect on the lifestyle and institutions of society. The impact is both cultural and scientific and is manifested by the awareness that solutions to society's problems are,

in part, technological. The major purpose of the general engineering program is to provide flexible, interdisciplinary educational opportunities based on fundamental engineering concepts. The interdisciplinary nature of the program allows the student to develop other areas of interest in which an engineering background is professionally useful.

Description of General Engineering Program

The program is designed for students whose interests are in engineering-related professions rather than in the traditional profession of engineering. It is expected that the work performed by graduates of this program will encompass the entire spectrum of professional activity, including such typical areas as computers, urban technology, social systems, and health care.

The general engineering program is highly elective and gives students the opportunity to develop, in conjunction with their adviser, a program designed to meet their own career objectives. To achieve this goal, the student is exposed to the fundamental engineering areas through courses in electric circuits, systems, mechanics, thermodynamics, and materials. These courses are based on principles developed in early courses in mathematics and physics. In addition, because the computer is a basic tool in any technological environment, each student is required to learn the elements of computer programming. Students completing the adviser-approved program receive an unspecified B.S. degree from the College of Engineering.

Graduate education and continuing education are increasingly important in professional life. By appropriately planning their programs, students will be able to satisfy the course requirements necessary for admission to various graduate and professional schools, including law, medicine, public health, and social sciences, as well as engineering.

The Five-Year Program

Each student in the program is required to satisfy the following minimum requirements beyond the freshman year:

- 8 quarter hours in mathematics
- 6 quarter hours in physics (including laboratory)
- 4 quarter hours in circuit theory
- 4 quarter hours in materials
- 4 quarter hours in systems
- 4 quarter hours in thermodynamics
- 16 quarter hours in social sciences (consisting of at least two sequences of two courses each from the areas of sociology, economics, political science, and psychology)
- 8 quarter hours in the humanities, consisting of at least two courses from the areas of art, history, language and literature (not including grammar), music, philosophy, and drama (not including public speaking)

The remaining portion of the program is completely elective but must be designed to fit the student's career objectives. At least twenty-four quarter hours of course work must be taken in the professional departments of the College of Engineering (chemical, civil, electrical and computer, industrial and information systems, and mechanical engineering).

Beyond the freshman year, students, in conjunction with a faculty adviser, plan their programs. Basically, the elective program permits each student to plan a distinctive and highly individual curriculum.

Although each student is enrolled in a unique program, the goals of each are the same: the breadth of an engineering-based liberal education in combination with the development of professional skills.



School of Engineering Technology

Thomas E. Hulbert, M.S., P.E., *Director and Associate Dean of Engineering*
Roy Dalsheim, B.S., *Assistant Director*
Rasma Galins, *Assistant Director*
John Kaczorowski, M.S., *Assistant Director*
Rosanne Bogan, *Staff Assistant*

Professors

Israel Katz, M.M.E., P.E.,
Engineering Technology
Thomas E. Phalen, M.S., P.E.,
Mechanical Engineering Technology
Ronald E. Scott, ScD., P.E.,
Visiting Professor, Engineering Technology

Associate Professor

Ernest E. Mills, M.S., P.E.,
Mechanical Engineering Technology

Assistant Professors

David Allen, M.S., *Design Graphics*
Amir Farhat, Ph.D., *Electrical Engineering Technology*
David S. Goldman, M.S., P.E.,
Computer Technology
Eric W. Hansberry, M.S., P.E.,
Design Graphics
Nonna K. Lehmkuhl, M.S.,
Computer Technology
Leszek Reiss, M.S., *Computer Technology*
Ronald U. Telson, M.S.,
Computer Technology

The programs offered by the School of Engineering Technology concentrate on the applications of technology rather than its development.

Emphasis is placed on the rational processes involved in converting theories and ideas into practical techniques, procedures, and products. The engineering technologist works with the professional engineer, scientist, medical doctor, supervisor, and craftsman in converting scientific knowledge and craftsmanship into products and techniques. Fundamentals are related to current practice, providing a supportive “why” for the practical “how.” At the same time, study of the humanities and social sciences gives students an opportunity to develop an awareness of the social, economic, and political influences that are part of the real world.

Professional Preparation

The structure of the engineering technology curriculum is based upon the dual need for relevant technical skills and a foundation for future growth. Engineering technology education can assist students to:

1. Understand the scientific principles that govern the current technology of the particular branch of engineering that they select;
2. Develop competence in the application of technology to problem solving;

3. Communicate effectively the important implications of technological advancements;
4. Acquire the motivation for continued development of technical skills.

The Five-Year Programs

The school offers five-year cooperative education programs in mechanical engineering technology, electrical engineering technology, and computer technology leading to the degree of bachelor of engineering technology.

Since the first year of study is similar for electrical and mechanical engineering technology students, a firm choice of major may be delayed until the spring. At this time, the choice of cooperative work assignments makes a decision mandatory. Students who choose to major in computer technology must decide on this major during the first quarter of their freshman year due to the unique program. Freshman courses act as a foundation for upper-class studies. About four-fifths of the upperclass program is devoted to scientific and technological study and about one-fifth to humanistic-social courses, with the aim of balancing technical proficiency with an appreciation for the nontechnical aspects of society and culture. Cooperative work assignments during the upperclass years are most valuable in helping students to integrate the important elements of both a technical and a liberal education.

Transfer Aerospace Co-op Program

The school is offering, for transfer students, a three-year bachelor of engineering technology degree program with a major in aerospace maintenance engineering technology. This B.E.T. program, in cooperation with East Coast Aero Technical School, is designed for students who have successfully completed a program in aircraft and power plant mechanics or similar technician programs. During their three years of study at Northeastern, these students participate in the cooperative education system.

Evening and Weekend Part-Time Programs

The school also offers six- and seven-year, part-time curricula leading to the degree of bachelor of engineering technology in the following areas:

- Civil engineering technology
- Mechanical engineering technology
- Mechanical-structural engineering technology
- Electrical engineering technology
- Computer technology

Aerospace maintenance engineering technology (transfer)

Classes are held either in the evenings or on Saturdays. The evening classes generally meet two times per week. For further information on admission to these programs, contact the School of Engineering Technology office at 120 Snell Engineering Center.

Graduation Requirements	<p>Candidates for the bachelor of engineering technology degree must complete all of the prescribed work of the curriculum in which they seek to qualify. A total of approximately 186 quarter hours is required for the degree. Students who undertake the co-operative education program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.</p> <p>Students transferring from another college or university are not eligible to receive the degree until they have completed at least one academic year at Northeastern University immediately preceding their graduation.</p>
Graduation with Honors	<p>Baccalaureate candidates who have attained superior grades in their academic work will be graduated cum laude. Upon special vote of the faculty, a limited number of this group may be graduated magna cum laude or summa cum laude. Students must have been in attendance at the University at least six academic quarters and have earned a minimum of 72 quarter hours of credit before they may become eligible for honors at graduation.</p>
Accreditation	<p>Both the electrical and mechanical engineering technology baccalaureate day programs, as well as the evening part-time baccalaureate programs in mechanical, mechanical-structural, civil, and electrical engineering technology, are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET).</p>
Laboratories and Facilities	<p>Electrical</p> <p>From light machinery and power equipment to microwave precision systems, students plan and pursue their experiments and projects in the laboratory. A variety of micro computers, including IBM PC's and Apples, are available for direct programming or use in other laboratory experimentation. VAX terminals are available in the laboratory for direct access to the University's Digital Equipment VAX mainframe computer. The College of Engineering has Data General and VAX 785 mainframe computers for use in general programming courses. In addition, a number of personal computers are available for student use.</p> <p>Mechanical</p> <p>The mechanical engineering technology laboratories contain equipment ranging from an electron microscope and ultrasonic measuring devices to pumps and weirs. Students working on thermofluids projects may use a turbine and various types of engines. A material science laboratory provides research microscopes, various furnaces, a fluid-to-fluid extrusion press, X-ray diffraction</p>

equipment, electron microscope, and other related equipment. For the mechanics and design areas, vibrations, experimental stress analysis, and materials testing facilities are provided.

Computer facilities available to the mechanical engineering technology student include various microcomputers for in-laboratory analysis. A new state-of-the-art Computervision CDS 4001 CAD/CAM system supporting five work stations is available to students.

Academic Computer Services

Academic Computer Services is the support arm for the many computer-oriented curricula of the various departments throughout the University. Equipment has been updated with the installation of a third powerful Digital Equipment VAX series system with time-sharing capability. Available computation equipment include a Data General MV/8000 mainframe computer supporting forty terminals, a Computervision Designer V computer-aided design system with three work stations and the IBM Fastdraft computer-aided drafting system supporting two work stations and an IBM PC. In addition to this equipment the Engineering Center has a Computervision CDS 4001 CAD/CAM system, supporting three high resolution color work stations and two monochrome work stations. A Digital Equipment Corporation VAX 11/785 supporting thirty-two terminals has been installed in the Engineering Center to further enhance the computing capabilities of the College of Engineering faculty and students. These systems, along with continued development of microcomputer clusters, are designed for both student and faculty use. As the prime computation center necessary to meet curriculum requirements, Academic Computer Services is used by School of Engineering Technology students.

Women in Engineering Technology

Many women enter the technology field each year. Both government and industry provide positions of responsibility for women technologists. Any woman with technical or scientific interests and aptitude should consider engineering technology as a career.

Sample Freshman-Year Program

The freshman-year program of studies in School of Engineering Technology is similar for all majors in the school.

First Quarter
College Algebra
Physics I
English/Writing
Engineering Design Graphics I

Second Quarter
Pre-calculus
Physics II
English/Literature
Computer Programming for
Engineering Technology*
Physics Lab I

Third Quarter
Calculus 1
Physics III
English/Technical Writing
Physics Lab II
Engineering Design Graphics
II*

In addition to the above courses, students may elect to take Basic ROTC.

* Computer Technology students take Introduction to Programming, Basic Computer Organizations instead of Computer Programming for Engineering Technology and Engineering Design Graphics.

Middler-Year Writing Requirement: Beginning with the class of 1989, all day students will be required to fulfill the Middler-Year Writing Requirement (MYWR) during the middler year.

All external transfer day students entering the University with 80 or more credits must complete the MYWR during one of the first two quarters they are enrolled at Northeastern. No transfer credits for writing courses or examinations taken at previous institutions may be applied towards the requirement.

The School of Engineering Technology requires students to take the Writing Workshop (ENG 1340). This is a one-credit, pass/fail writing course in which the student writes a long paper, often in conjunction with another course. The Writing Workshop is an interdisciplinary course which provides an orientation to word processing.

Computer Technology Program

Nonna K. Lehmkuhl, M.S., *Coordinator for Computer Technology*

Degree Offered: Bachelor of Engineering Technology

The computer technology program is designed to supply a portion of the manpower needs for the complex computer industry. Graduates of this program may become an integral part of the engineering support team which develops techniques to implement the engineering design project. In this capacity, they become a research and production team which maintains a close cooperation and communication with the engineers.

Professional Preparation

The program is designed to provide students with both academic and technical learning experience, using a basic core curriculum which provides courses in theoretical and technical areas. Students also choose technical electives in their area of interest. Theory courses are offered at the higher levels of the technology spectrum. These higher level theory courses provide the means for students to continue their educational and professional development beyond the baccalaureate level. Some students may be prepared to pursue the master of technology degree or, through supplemental course work, the more theoretical bachelor of science degree.

The Five-Year Major

Computer technology deals with the design and application of equipment and systems related to the hardware and software aspects of computers. Its major functions include:

- 1. Interfacing the computer with process plants or machinery;
- 2. Programming the computer for engineering, scientific, and business applications;
- 3. Designing, engineering, and testing computers;
- 4. Interfacing computers to various types of equipment for automatic drafting, data collection, design, and display.

The present-day high-speed computers have been realized through the application of technology developed in the electrical and the electronic fields. Because of this interdependence, the program of study for computer technology begins, as in electrical engineering technology, with the basic courses in mathematics and physics.

An introduction to computer programming and the study of basic computer organization provide an early contact with the major field of study. In addition, the freshman year includes literature and engineering graphics to aid students in developing the skills to express themselves.

In the upperclass years the balance of hardware and software courses, combined with hands-on laboratory experience, provides the student with the opportunity to develop skills for interfacing the computer with various systems or to design computers and the related systems of programs. Current practice is stressed.

The senior year technical electives are offered to ensure that students acquire both depth and specialization.

The freshman-year program of studies in the School of Engineering Technology's computer technology major is similar to that of the electrical or mechanical engineering technology, with the exception of courses Introduction to Programming and Basic Computer Organization. These courses are taken in place of Computer Programming for Engineering Technology and Engineering Design Graphics II.

Basic Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
College Algebra*	4	Engineering Design	
Pre-calculus*	4	Graphics I*	4
Calculus 1*	4	Introduction to	
Calculus 2 & 3.	8	Programming*	4
English*	13	Basic Computer	
Principles of Economics†	4	Organization*	4
Physics I, II, III*	12	Social science/humanities	
Physics Lab. I & II*	4	electives	16

* Usually taken in freshman year.

† Usually taken in sophomore year.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Circuit Analysis I & II	8	CPU Hardware	
FORTRAN	4	Architecture	4
Semiconductor Logic	4	Non-numerical Algorithms	4
Electronics I	4	Micro-peripheral	
Modern Programming		Hardware	4
Techniques	4	Numerical Algorithms	4
Computer Logic	4	Data Communications	
“C” Language	4	Methods	4
Assembly Language	4	Industrial Software	4
Introduction to CPU		Industrial Hardware	4
Hardware	4	Computer Peripheral	
Technical electives	16	Hardware	4
Advanced Computer			
Organization	4		

Electrical Engineering Technology Program

Thomas E. Hulbert, M.S., P.E., *Acting Coordinator for Electrical Engineering Technology*

Degree Offered: Bachelor of Engineering Technology

The electrical engineering technology program is directed toward supplying some of the manpower needs of the industrial complex and high technology industries. Because of the nature of high technology industries, close communication and cooperation is required between the technologist and the engineer in forming a viable working team. Students through their cooperative work assignments in industry bear evidence of this need.

Professional Preparation

The electrical engineering technology program is designed to provide the student with a broad education through the use of a basic core curriculum. Courses are offered at a high level of theory at the upper end of the technology spectrum. Technical electives are offered to accommodate the student's area of interest.

The higher theoretical level provided in the program also prepares students to continue their education beyond the bachelor of engineering technology degree. These continued studies could be toward a master of technology degree or, through supplemental course work, could prepare them for more theoretical engineering science subject areas.

Electrical engineering technology deals with the design and operation of equipment and systems related to power, communications, data processing, and electrical control. Its major functions include:

1. The generation, transmission, and distribution of electrical energy for light and power purposes;
2. The development and production of equipment for telephone, radio, television, radar, and communication;
3. The design and construction of data-processing systems and analog or digital computers;
4. The application of electrical and electronic devices in the control of processes and manufacture.

The Five-Year Major

Since electrical engineering technology derives many of its fundamentals from developments in the pure sciences, the program of study begins with basic courses in mathematics and physics. In addition, the freshman year includes literature and engineering graphics to aid students in developing the skills with which to express themselves.

In the upperclass years, courses are divided into four related sequences: circuits and systems, including feedback control; microwave devices; energy conversion, emphasizing electromagnetic devices; and laboratory work associated with all of the aforementioned. Current practice is stressed.

In the senior year, electives are offered to ensure that students acquire both depth and specialization.

The freshman-year program of studies in the School of Engineering Technology is similar for electrical and mechanical engineering technology. See page 191.

Basic Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
College Algebra*	4	Physics I, II, III*	12
Pre-calculus*	4	Physics Lab I & II*	4
Calculus 1*	4	Social science/humanities	
Calculus 2 & 3†	8	electives	20
English*	13	Speech/Communication	
Principles of Economics	4	elective	4
Engineering Design			
Graphics I & II*	8		
Computer Programming			
for Engineering			
Technology*	4		

* Courses are taken in the freshman year.

† Courses are taken in the sophomore year.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Circuit Analysis I & II†	8	Distributed Systems	4
Circuit Analysis III & IV	8	Circuits Lab I†	2
Electronics I, II, III	12	Circuits Lab II	2
Control Engineering I & II	8	Electronics Lab	2
Engineering Analysis I	4	Advanced Electronics	
Energy Conversions	4	Lab I, II, III	6
Electrical Measurements	4	Pulse and Digital I	4
Mechanics	4	Technical electives	16
Digital Computers I & II	8		

† Courses are taken in the sophomore year.

Mechanical Engineering Technology Program

Ernest E. Mills, M.S., *Coordinator for Mechanical Engineering Technology*

Degree Offered: Bachelor of Engineering Technology

The objectives of the program are to prepare the graduate for technical support activities as a technologist in the broad field of mechanical engineering technology. This technical field deals with the use of machinery to harness power resources and perform useful work. In contrast to civil engineering, which deals primarily with static forces and structures, mechanical engineering technology is more concerned with the motion and kinetics of devices activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineering technologist include:

1. Design and installation of all kinds of machinery, from pocket watches to the largest steel boring mills;
2. Development and production of engines and transport equipment, as in automobiles, aircraft, ships, or railway cars;
3. Construction and operation of furnaces and boilers, as well as heating and air-conditioning equipment, for the control of atmospheric and environmental conditions.

Professional Preparation

The student who has learned the principles of science and mathematics as applied to his or her field will be able to convert theories into practical techniques and processes.

The student will be shown how to effectively communicate this technical information so that he or she may become an integral component of the engineer-technologist-technician design and operations team.

The Five-Year Major

Since machinery is the predominant concern of the mechanical engineering technologist, the program of study is designed to offer considerable training in the principles underlying the design and operation of engines, power transmission devices, machine tools, and other machinery. This, of course, implies a thorough study of the physical laws concerning motion and transfer of energy. Applied mechanics, thermodynamics, and study of materials will occupy prominent places in the program.

These studies help provide the student with a broad foundation in those fundamental subjects essential to the understanding of current practice. In the senior year, students have elective choice and opportunity for specialization.

The freshman-year program of studies in the School of Engineering Technology is similar for electrical and mechanical engineering technology. See page 191.

Basic Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
College Algebra 4*	4	Computer Programming for Engineering Technology	4
Pre-calculus 4*	4	Social science/humanities electives	20
Calculus 1*	4	Chemistry	4
Calculus 2 & 3†	8	Speech/Communications elective	4
English*	13		
Principles of Economics	4		
Physics I, II, III*	12		
Engineering Economy	4		
Physics Lab I & II*	4		
Engineering Design Graphics I & II	8		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Mechanics A & B†	8	Thermodynamics A & B	8
Mechanics C	4	Fluid Mechanics A & B	8
Stress Analysis A & B	8	Technical Labs A, B, C, D, E	10
Materials A	4	Refrigeration and Air Conditioning	4
Engineering Design	4	Heat Transfer	4
Electricity and Electronics I	4	Machine Shop	4
Measurement and Analysis Lab A	2	Technical electives	12
Mechanical Design A & B	8		

* Usually taken in the freshman year.

† Usually taken in the sophomore year.



College of Nursing

Juanita O. Long, R.N., M.S.N., Ed.D., *Dean*
Joan Grindley, R.N., M.S.N., Ed.D., *Associate Dean*
Angelo J. Logiudice, M.Ed., C.A.G.S., *Assistant to the Dean*

Associate Professors

Jane Aroian, R.N., M.S.N., Ed.D.
Olivia M. Breton, R.N., M.Ed.
Elaine Capozzoli, R.N., M.A.
Janet Carroll, R.N., M.S.
Ellen T. Daly, R.N., M.S.N., Ed.D.
Flora M. DeScenza, R.N., M.S.
Margaret S. Edmands, R.N., Ed.D.
M. Paula Fellows, R.N., M.S.
Jean P. Gilbert, R.N., M.S., Ed.D.
Christine Hoag, R.N., M.S.N.
Lee Ann Hoff, R.N., M.S.N., Ph.D.
Mary C. Keaney, R.N., M.S.N., C.A.G.S.
M. Marcia Lynch, R.N., M.S.
Susan C. Marchessault, R.N., M.S.
Geraldine A. Medici, R.N., M.S.
Marilyn M. Smith, R.N., M.S., M.B.A.
Nancy Walden, R.N., M.S.N.
Mary E. Wilcox, R.N., M.S.
M. Delaine Williamson, R.D., M.S.

Assistant Professors

Nancy N. Carr, R.N., M.S.
Lael T. Cutler, R.D., M.P.H.
D. Jeanne Otto, R.N., M.S., M.Ed.
Janice B. Meisenhelder, R.N., M.S.N., D.N. Sc.
Mary Ann L. Ringquist, R.N., M.S., Ed.D.

Instructors

Katherine F. Ciganovic, R.N., M.S.N.
Maureen A. McMullen, R.N., M.S.
Darlene W. Perkins, R.N., M.S.N.
Linda M. Rosenbaum, R.N., M.S.N.
Kristen K. Schmidt, R.N., M.S.N.
Norma G. Silverstein, R.N., M.S.

Degree Offered: Bachelor of Science in Nursing

Professional Preparation

Nursing is a profession in which the knowledge base arises from scientific theory and research from nursing, the humanities, the biological, physical and social sciences. Professional nursing practice involves a systematic process of assessment, planning, intervention and evaluation, which is based on a sound body of

knowledge about clients and their environments. The educational objectives of the program are as follows:

1. Provide individuals with a broadly-based educational experience;
2. Prepare professional nurses capable of practicing in a variety of settings;
3. Provide the stimulus and requisite education for ongoing personal and professional growth;
4. Provide opportunities of professional nursing education for individuals from diversified backgrounds and/or changing career goals;
5. Provide additional opportunities through cooperative education for the integration of theory with practice in selected settings;
6. Provide the educational background for graduate study in nursing.

The College of Nursing offers an undergraduate program designed to prepare students to assume responsibility for providing quality nursing care for individuals in collaboration with clients and other health care professionals.

Upon completion of the program graduates are eligible to take the examination for licensure by the state to become registered nurses. Graduates are qualified to practice in hospitals, community health agencies, clinics, nursing homes, military service, and many other health care facilities. This program also provides the foundation for graduate studies.

The Five-Year Program

In keeping with its commitment to professional nursing education, the College of Nursing offers a course of study which emphasizes nursing theory and nursing research, the humanities, and the biological, physical, and social sciences. The curriculum provides many opportunities for the student to learn about the health needs of society and to assume beginning responsibility for providing quality nursing care for individuals in collaboration with clients and other health care professionals. The student has the opportunity to have planned sequential learning experiences in the classroom and health care settings under the instruction and guidance of the faculty. Approximately twenty-three health care agencies in the Greater Boston area are used to provide the student with experience in giving nursing care to clients in acute care, day care and community health agencies. The study of nursing begins in the freshman year. Clinical experience in health care settings is introduced in the second year of the program.

The College of Nursing was the first baccalaureate program in the nation to operate on a cooperative education plan. Beginning in the sophomore year, students alternate periods of academic

study with cooperative work experiences. During periods of employment, students have the opportunity to gain experience in nursing settings. The salary earned during the cooperative education assignments accrues directly to the student. Positions are available in a variety of areas including hospitals, community health agencies, and private industry. Cooperative work experiences are available not only in the Greater Boston area but also in selected sites across the country. Tuition is charged only for academic quarters.

Students are admitted in September and January. Transfer students are accepted in September and January, and into a specially designed program in the summer.

Graduation Requirements

A minimum of 177 quarter hours of credit with a minimum nursing quality point average of 2.0 and an overall quality point average of 2.0 are required for the degree of Bachelor of Science in Nursing.

Honors Program

The College of Nursing participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

Accreditation

The program of the College of Nursing is fully accredited by the National League for Nursing and approved by the Board of Registration in Nursing of the Commonwealth of Massachusetts.

Opportunities for Registered Nurses

The College of Nursing accepts registered nurses who wish to complete requirements for the Bachelor of Science degree in Nursing. The length of the program varies depending upon the individual's previous educational experience and ability to achieve advance placement through selected testing methods.

Transfer Credit

Students may be allowed to transfer credits earned in courses at other institutions if a grade of C or better has been obtained and if the courses are comparable to courses required at Northeastern University. It is unusual for specific nursing courses to be transferable.

Special Requirements	<p>Every student must have a complete physical examination, including a tuberculin test, before registering for first quarter classes. Similarly, proof of immunization against German measles is required unless a satisfactory antibody titre against German measles is demonstrated.</p> <p>All students must carry malpractice insurance. Arrangements for this insurance are made by the University.</p> <p>Students in the College of Nursing are required to wear the school uniform in clinical laboratory areas during academic quarters. A modification of the uniform is worn during cooperative work periods.</p>
The Nursing Resource Unit	<p>The Nursing Resource Unit (NRU) is located in 209 Robinson and is designed as a simulated hospital setting for student learning. The area has a study room where current professional nursing journals are located as well as some of the current textbooks used in the nursing program. The unit houses sophisticated equipment such as the ACTRONICS interactive video system for CPR (Cardiopulmonary Resuscitation) learning.</p>
Peer Support Program	<p>The College has established a Peer Support program to facilitate the transition to University life for the freshman student. Upper-class students volunteer to serve as mentors to freshmen and maintain contact throughout the freshman year.</p>
Student Participation On Committees	<p>Students have both a right and a responsibility to participate in College of Nursing policy making and evaluation through committee activities. Representatives of the student body hold membership on the Academic Standing Committee, the Curriculum Committee, and ad hoc committees. Representatives to Standing Committees are elected by the student body and ad hoc committee members may be either elected or appointed by the Office of the Dean.</p>

**National Student Nurses’
Association Inc. (N.S.N.A.)**

The National Student Nurses’ Association Inc. is the largest independent student organization in the country and provides numerous benefits, which include subscription of *Imprint*, scholarships, reduced rates for the *American Journal of Nursing*, monitoring of legislation that affects nursing students and educational programs and conventions. All Northeastern University College of Nursing students are eligible to join the N.S.N.A.

Sample Freshman-Year Program

First Quarter	Second Quarter	Third Quarter
Biology	General Chemistry	General Chemistry
Elective	Biology	Anatomy
English	English	History elective
Nursing	Nursing	Human Nutrition

NOTE: Current requirements are now being revised. Information concerning new requirements may be obtained from the Office of the College of Nursing, 102 Robinson Hall.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
Biology	8	Pharmacology	3
English	8	Fundamentals of Psychology I & II	8
General Chemistry	10	Social Anthropology	4
Anatomy	4	Principles of Sociology	4
Microbiology	4	Social Psychology	4
Physiology	8	Electives* (8)	32
Growth and Development I & II	8		

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Nursing	8	Community Health Nursing	9
Human Nutrition	4	Issues in Contemporary Nursing	5
Nursing	12	Introduction to Nursing Research	4
Nursing	7		
Medical-Surgical Nursing	9		
Maternal-Child Nursing	9		
Psychiatric-Mental Health Nursing	7		

* Three of the electives are designated electives: 4 Q.H. of humanities, 4 Q.H. of history, and 4 Q.H. of English to meet the University’s Middler-Year Writing Requirement.



College of Pharmacy and Allied Health Professions

Gerald E. Schumacher, Pharm. D., Ph.D., *Dean*
Judith T. Barr, M.Ed., *Associate Dean*
James J. Gozzo, Ph.D., *Associate Dean and Director, Graduate School of Pharmacy and Allied Health Professions*
Joseph F. Palumbo, M.S., *Assistant to the Dean for Student Affairs*
Anne M. Ahern, M.Ed., *Director, Academic Support Services*
Kathleen T. Foley, A.S., *Assistant to the Dean*
Janise A. Alomar, M.S., *Director, Health Careers Opportunity Program*

Northeastern University recognizes the increased demand for well-educated pharmacists and allied health professionals. The College of Pharmacy and Allied Health Professions has pledged to meet this need through a unique combination: the Cooperative Plan of Education and a highly innovative academic program designed to offer students the opportunity to prepare themselves to become effective professional practitioners, to enter graduate schools, and to obtain employment in the many areas responsible for the delivery of health care.

Professional Preparation

Fundamental to the College's approach to health-care education are:

1. A curriculum of highly relevant and closely integrated courses in the physical, biological, behavioral, and administrative sciences comprising the basis of modern professional practice;
 2. A meaningful involvement in the clinical aspects of patient care via affiliations with teaching hospitals and related institutions;
 3. A cooperative education work program, including an externship-internship period, and a clinical component offering students the opportunity to acquire the skills and actual experience integral to the total program;
 4. A commitment to the search for and advancement of new and progressive concepts, ideas, and philosophies of education and professional practice.
-

Facilities

The College occupies the Mugar Life Sciences Building on the main campus of the University. Completed in 1963, this multimillion-dollar facility offers proximity to all the academic and extra-curricular activities of the University.

The building and the Amelia Peabody Health Professions Center addition, with its well-equipped laboratories and classrooms, are designed to anticipate the physical needs of a growing and progressive college. In addition to faculty and administrative offices, a drug information and resource center, a data-processing

area, and the graduate school, there are laboratories for radio-isotopes, clinical chemistry, medicinal chemistry, drug analysis, prescription pharmacy, hematology, immunology, pharmacology, respiratory therapy, medical record science, and clinical microbiology. Animal rooms and audiovisual capabilities for all programs are also featured in this five-story structure. Research facilities are available for upperclass students who participate in original research projects.

Transfers with Advanced Standing

The College of Pharmacy and Allied Health Professions may accept qualified transfer students who have successfully completed one or more years of preprofessional course work in an accredited college or university.

Accreditation

Each of the programs offered by the College is accredited by the appropriate professional group. The College holds memberships in both the American Association of Colleges of Pharmacy and the American Society of Allied Health Professions.

Graduation with Honors

Candidates who have attained superior grades in their academic work will be graduated cum laude. Upon special vote of the faculty, a limited number of this group may be graduated magna cum laude or summa cum laude. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

Honors Program

The College of Pharmacy and Allied Health Professions participates in the University-wide honors program. For further information, please refer to the University Honors Program in the Undergraduate Admissions section on page 250.

Health Record Administration Program

Judith Weilerstein, M.P.H., *Associate Professor and Director*

Assistant Professor
Leslie A. Blide, M.A.

Degree Offered: Bachelor of Science

A health record administrator organizes, operates, and manages medical record services. Northeastern's program offers students the opportunity to develop the capability to design manual and automated health information and retrieval systems; to plan, organize, and direct medical record services; to develop, analyze,

and evaluate medical records and indexes; to work with medical and administrative staffs in developing methods for evaluation of patient care; and to participate in research projects utilizing health-care information.

The Five-Year Major

The health record administration program is offered on the Cooperative Plan of Education. Successful completion of the prescribed curriculum, including directed study at an affiliated health center, will permit the award of a bachelor of science degree. Usually, graduates are eligible to take the registration examination given by the American Medical Record Association.

In the first two years of the program, the student will concentrate on liberal arts and sciences, including the required human anatomy and physiology courses and an overview of microbiology. Courses in health-care science are offered to help the student prepare for a role in health administration and health-care delivery.

The program offers the opportunity for preparation in administration, in departmental and hospital management and organization, and in electronic data processing. The professional courses in medical record science, medical terminology, and hospital law are complemented by directed applied study in medical record science at an affiliated health facility.

Certificate Program

The one-year Health Record Administration Certificate program is designed for candidates holding a baccalaureate or master's degree who desire to enter a new career. The four-quarter curriculum is designed to offer students who have demonstrated leadership potential and self-direction the opportunity to participate in an accelerated program that includes an integrated clinical practice experience. This clinical practice begins in the second quarter and totals more than 300 hours, including a three-week management experience at the conclusion of the last quarter.

Accreditation

The Health Record Administration program is accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association in cooperation with the Council on Education of the American Medical Record Association (COE-AMRA).

Special Information

Students interested in this profession should arrange for an interview with the program director.

Sample Freshman-Year Program

First Quarter	Second Quarter	Third Quarter
English I	Biology	Psychology
Biology	Math	Arts and Science elective
Math	Arts and Science elective	Microbiology
Psychology	Professional Dynamics in the	English II
Orientation to Health	Health-Care Delivery System	
Records I		

In addition to the above courses, students may choose to take ROTC.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
English Composition and English Literature*	8	Psychology*	8
Mathematics*	8	Sociology or Anthropology†	4
Biology (General and Animal)*	8	Arts and Science electives	16
Microbiology*	3	Introduction to Communication	4
Organizational Behavior	4	Electives	12
Introduction to Computer Science	4	Middle-Year Writing Requirement	1

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Language of Health Professions	2	Health Science Education	2
Health Records Science I-IV	16	Directed Practice	8
Language of Medicine	4	Application of Medical Computers	4
Foundations of Medical Science	6	Quality Assurance	4
Hospital Law	2	Independent Study	4
Management of Health Record Services	12	Special Topics**	4
Applied Health Statistics	4	Health Record Professional	2
Seminar in Health Records Statistics	2	Professional Dynamics in the Health-Care Delivery System*	4
	4	Data Processing	4
		Anatomy and Physiology†	10
		Systems Analysis	4

* These courses are usually taken in the freshman year.

** Assigned by the program director.

† These courses are usually taken in the sophomore year.

Medical Laboratory Science (Medical Technology) Program

Gerald L. Davis, MT, (ASCP) Ph.D., *Associate Professor and Director*

Professor

James J. Gozzo, Ph.D.

Associate Professors

Judith T. Barr, MT, (ASCP)
M.Ed.

Britta L. Karlsson, MT, (ASCP)
M.S.

Assistant Professors

Robert F. Martin, Ph.D.

Elizabeth G. Szymczak, MT,
(ASCP) M.S.

Degrees Offered: Bachelor of Science, Associate in Science

Medical technology involves the application of principles of natural, physical, and biological sciences to the performance of laboratory determinations used in the diagnosis and treatment of disease and the maintenance of health.

Professional Preparation

It is projected that the demand for properly educated and certified medical technologists and medical laboratory technicians will increase as a result of greater emphasis on the quantity, quality, and efficiency of health-care delivery. With educational opportunities available in hematology, immunohematology, clinical chemistry, and clinical microbiology, students have the opportunity to prepare themselves for positions not only in a hospital laboratory but also in research, industrial, and governmental institutions. Related co-op work experience in hospitals, clinics, research, and industry helps prepare the graduates for a variety of positions in the working world. Since 1976, opportunities for six months of co-op work experiences in foreign countries have been available to interested students. These have been an enriching experience for the participants.

For qualified graduates, additional opportunities may be found in laboratory administration, education, and graduate programs.

The Five-Year Major

Students enter the College of Pharmacy and Allied Health Professions in the medical laboratory science program (medical technology). The college offers a five-year modified cooperative course of study leading to the bachelor of science degree. Upon satisfactory

completion of the baccalaureate degree, the student should be eligible to take national certification examinations in medical technology and clinical laboratory science. Some states may require additional licensure examinations.

During the junior and senior years, qualified students are assigned to the hospital components of the medical technology program. To qualify for entrance into the hospital component of the program, students must have an acceptable grade point average; have successfully completed all University course requirements, including those in biology, chemistry, mathematics, and medical laboratory science; and have met other criteria established by the Clinical Studies Admission Committee. The professional courses in hematology, pathogenic microbiology, serology, mycology, parasitology, clinical chemistry, instrumentation, and blood banking are included in both the University and the hospital components of the program.

Students in the five-year major who decide not to complete their course of study may transfer into the three-year associate degree program.

The Three-Year Major

Students enter the College of Pharmacy and Allied Health Professions as medical laboratory science (medical laboratory technician) majors. This three-year modified co-op program leads to an associate degree.

The first two years of academic study parallel the baccalaureate program. During the third year students alternate related co-op work experience with clinical applied studies at affiliated hospitals.

During the middler (third) year, qualified students are assigned to the hospital components of the medical laboratory technician program. To qualify for entrance into the hospital component of the program, students must have an acceptable grade point average; have successfully completed all other requirements of the program; and have met the criteria as defined by the program.

Upon completion of the professional component of the program, students are eligible to write national certification examinations for medical and clinical laboratory technician.

Accreditation

The associate in science and the bachelor of science degree programs are accredited by the Committee on Allied Health Education and Accreditation of the American Medical Association.

Sample Freshman-Year Program

First Quarter	Second Quarter	Third Quarter
Math or Calculus	Math or Calculus	Computer Science Elective
General Chemistry	General Chemistry	Elective
General Biology	Animal Biology	English II
English I	Professional Dynamics in the	Basic MLS Urinalysis
Medical Laboratory Science	Health-Care Delivery System	Analytical Chemistry
Orientation I	Medical Laboratory Science	
	Orientation II	

Basic Course Requirements for the Baccalaureate Degree

I. General Requirements

Course	Q.H.	Course	Q.H.
English and English Literature*	8	Genetics and Developmental Biology	4
Biology—General and Animal*	8	Physics	10
Math or Calculus*	8	Microbiology	3
General Chemistry*	10	Humanities electives	12
Organic Chemistry†	10	Social Science electives	8
Analytical Chemistry*	4	General electives	16–28
Physiology†	8	Statistics Elective	4
Cell Biology	4	Middler-Year Writing Requirement	1

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Medical Laboratory Science Orientation I & II*	2	Advanced Hematology II	2
Basic M.L.S. Urinalysis	3	Advanced Clinical Chemistry I, II, III	6
Basic M.L.S. Hematology I†	3	Advanced Clinical Microbiology I, II, III	6
Basic M.L.S. Hematology II†	3	Applied Clinical Study (at hospital)	21
Basic M.L.S. Immunohematology, and Serology†	6	Laboratory Management	2
Basic M.L.S. Chemistry and Instrumentation†	5	Health Science Education	2
Basic M.L.S. Clinical Microbiology†	6	Parasitology	3
Advanced Hematology I	3	Mycology	3
Advanced Immunohematology	2	Senior Seminar	2
		Special Topics	2
		Professional Dynamics in the Health-Care Delivery System*	4
		Advanced Immunology	4

* These courses usually taken in the freshman year.

† These courses usually taken in the sophomore year.

Basic Course Requirements for the Associate Degree

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English and English Literature*	8	General Chemistry*	10
Biology—General and Animal*	8	Analytical Chemistry*	4
Math or Calculus*	8	Physiology†	8
		Humanities elective	4
		Computer Science	4

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Medical Laboratory Science Orientation I & II*	2	Basic M.L.S. Clinical Microbiology†	6
M.L.S. Urinalysis*	3	Basic M.L.S. Immunohematology and Serology†	6
Basic M.L.S. Hematology I†	3	Basic M.L.S. Clinical Chemistry and Instrumentation†	5
Basic M.L.S. Hematology II†	3	Applied study (at hospital)	12
Professional Dynamics in the Health Care Delivery System	4		

* These courses are usually taken in the freshman year.

† These courses are usually taken in the sophomore year.

Pharmacy Program

Gerald E. Schumacher, Pharm.D., *Professor and Coordinator*

Medicinal Chemistry Section

Robert N. Hanson, Ph.D., <i>Associate Professor and Section Leader</i>	<i>Professors</i> Roger W. Giese, Ph.D. John L. Neumeyer, Ph.D.
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Pharmaceutics Section

Mehdi Boroujerdi, Ph.D., <i>Assistant Professor and Section Leader</i>	<i>Assistant Professors</i> George C. Hwang, Ph.D. Harry Suryakusuma, Ph.D.
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Pharmacology Section

Norman R. Boisse, Ph.D., <i>Associate Professor and Section Leader</i>	<i>Associate Professor</i> Richard C. Deth, Ph.D.
<i>Professors</i> O. James Inashima, Ph.D. Elliot Spector, Ph.D.	<i>Assistant Professor</i> Barbara L. Waszczak, Ph.D.

Pharmacy Practice Section

Larry N. Swanson, Pharm.D.,
*Associate Professor and Section
Leader*

Professor

Arnold S. Goldstein, L.L.M.

Associate Professors

Robert J. Cersosimo, Pharm.D.

Samuel J. Matthews, Pharm. D.

Assistant Professors

Kimberly Mu-Chow, Pharm.D.

Alan H. Mutnick, Pharm.D.

Suellen O'Neill, Pharm.D.

Degree Offered: Bachelor of Science in Pharmacy

Professional Preparation

The need for well-qualified pharmacists is likely to continue in direct response to the greater emphasis on health care and, in particular, to the newer and more diversified utilization of those now in practice in this country. The majority of pharmacists are associated with community practice, and some of these are self-employed. Hospital pharmacy and institutional practice have attracted a large number of practitioners and represent the fastest-growing areas of the profession. The increased use of the pharmacist as a drug consultant to the medical and nursing staffs of these institutions has broadened the scope of professional opportunity and given practitioners even greater involvement as part of the health team.

Pharmacy also offers careers in research, manufacturing, government, law enforcement, and education. A considerable number of our graduates have entered leading graduate and professional schools. Another significant trend is found in the increasing number of women entering the profession. Approximately 60 percent of the entering class is now composed of women.

The Five-Year Major

The College offers a five-year curriculum that leads to the degree of Bachelor of Science in Pharmacy. The curriculum offers instruction in each of three natural divisions: (1) arts and sciences courses in general education (the humanities and social sciences); (2) mathematics and the basic physical and biological sciences; and (3) courses in the areas of professional instruction—medicinal chemistry, pharmacology, pharmaceuticals, pharmacy administration, pharmacy practice, and clinical pharmacy.

The curriculum offers a well-balanced blend of academic classroom and cooperative education work experiences. Students completing the five-year baccalaureate pharmacy degree at Northeastern complete up to 3,000 hours of combined co-op and clinical clerkship experiences—a much greater practical experience base than is available at many other pharmacy programs. We believe these experiences enable our students to easily make the

transition into pharmacy practice upon graduation. The classroom experience is well-structured and allows for the integration of the students' cooperative learning experiences. In addition, the pharmacy program maintains close affiliations with many of the leading hospitals in the surrounding Boston area.

Graduation Requirements

Candidates for the Bachelor of Science in Pharmacy degree must complete all prescribed work of the curriculum and meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until the last three years of academic work immediately preceding graduation have been completed at Northeastern. Exceptions to this requirement may be made for students transferring from another college of pharmacy.

Accreditation

The undergraduate pharmacy program offered by the College of Pharmacy and Allied Health Professions subscribes to the standards established by the American Council on Pharmaceutical Education and the American Association of Colleges of Pharmacy, of which it is a member.

Licensure

Pharmacists must meet certain requirements to obtain a license from the state in which they wish to practice. These requirements ordinarily include graduating from an accredited college of pharmacy, passing an examination given by a state board of pharmacy, and completing an "internship," or apprenticeship.

The internship is a period of supervised practical experience in a preceptor pharmacy. This is generally satisfied during the cooperative work periods commencing at the end of the student's second academic year. The salary earned during these periods of full-time employment may be used to help defray educational expenses. Students may apply up to 400 hours of the required academic clinical clerkship experience to their internship requirements. In addition, a college-directed externship adds to the total practice-oriented portion of the curriculum.

Sample Freshman-Year Program

First Quarter	Second Quarter	Third Quarter
Basic Calculus*	Calculus	Biology
General Chemistry	Professional Dynamics in the Health-Care Delivery System	English II
Arts and Sciences electives	Biology	General Chemistry
	English I	Arts and Sciences elective

In addition to the above courses, students may choose to take Basic ROTC.
* Students who are not adequately prepared may need to take other math courses.

Basic Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Basic Calculus*	4	Anatomy-Physiology†	10
Calculus*	4	Biochemistry	5
General Chemistry*	10	Arts and Sciences electives (7)	28
English*	8	Middler-Year Writing Requirement	1
Biology*	8		
Physics†	8		
Organic Chemistry†	10		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Basic Pharmacy†	3	Professional Dynamics in the Health-Care Delivery System*	4
Pharmaceutics I & II, including Laboratories	12	Professional electives (2)	8
Medicinal Chemistry/ Pharmacology I, II, III	16	Professional Practice Lab	1
Pharmaceutical Analysis and Quality Control	4	Clinical Pharmacotherapeutics	5
Drug Information & Evaluation	3	Pharmacokinetic Principles in Drug Therapy	4
Pathology	4	Pharmacy Management	4
Toxicology	4	Anti-infectives	5
Biopharmaceutics/ Pharmacokinetics	4	Parapharmaceuticals	2
Pharmacology Lab	2	Non-prescription Medication	4
Jurisprudence	4	Interpersonal Skills for Health Professionals	4
Pharmacy Administration	4	Pharmacy Externship	4
Clinical Pharmacy Clerkship	15	Social Pharmacology	4

* These courses are usually taken in the freshman year.

† These courses are usually taken in the sophomore year.

Toxicology Program

David R. Brown, Sc.D., *Associate Professor and Director*

Associate Professor

Robert A. Schatz, Ph.D.

Degree Offered: Bachelor of Science in Toxicology

Toxicology can be defined as the branch of science dealing with poisons, but toxicology is not restricted to this narrow definition. In its broadest sense, toxicology involves all aspects of adverse

effects of chemicals on biologic systems. This includes their mechanisms of harmful effects and the conditions under which these harmful effects occur as well as socioeconomic considerations and legal ramifications.

The activities and contributions of toxicologists are many and varied. The profession's subdivisions of materials, radiation, and veterinary toxicology illustrate the diversity of investigations in which toxicologists may participate. The toxicologist working in the biomedical area is concerned with intoxications by drugs and other chemicals as well as the demonstration of drug safety or danger prior to release on the market.

Industrial or environmental toxicologists are concerned with the recognition, identification, and quantitation of relative hazard from occupational or public exposure to toxicants. This concern is closely related to private and government responsibilities to ensure the safety of workers and the general public in contact with industrial and commercial products.

Forensic toxicology is a hybrid of analytical chemistry and fundamental toxicological principles, and is concerned with the medicolegal aspects of the harmful effects of chemicals.

Professional Preparation

The faculty of Northeastern University's College of Pharmacy and Allied Health Professions feels that increased concern over the safety of drugs, chemicals, and cosmetics in the human population and in the environment, as well as new legislation regarding toxic substances, creates a high demand for toxicologists at the bachelor of science level.

Northeastern University has created an innovative program in which its diverse academic resources offer training to this new breed of toxicologist. The core curriculum is enhanced by contributions from the University's Institute of Chemical Analysis, Applications, and Forensic Sciences, the Northeastern University Marine Science Institute in Nahant, and the Environmental Engineering faculty.

Recent manpower studies sponsored by private and federal agencies predict a great demand for toxicologists. Numerous federal and local laws aimed at protecting the environment, safeguarding employees in their workplace, and protecting consumers against hazardous household products has created a critical shortage of toxicologists. Employment opportunities are being created in industry (chemical, cosmetic, and pharmaceutical firms) and government (for example, Environmental Protection Agency, Food and Drug Administration, National Institute of Occupational Safety and Health) as well as in police departments and various clinical settings. Students may also consider entering graduate programs in toxicology.

The Five-Year Major

The toxicology program leads to the Bachelor of Science degree in Toxicology in five years under the Cooperative Plan of Education. The curriculum is a combination of liberal arts, science, and professional courses that offer students the opportunity to prepare themselves to practice toxicology in a variety of settings. Required and elective professional courses may be selected from Medical Laboratory Science, Chemistry, Biology, Sociology, Criminal Justice, Computer Programming, Mathematics, and Earth Sciences. Toxicology students begin their cooperative experience in the sophomore year.

Sample Freshman-Year Program

First Quarter	Second Quarter	Third Quarter
Mathematics	Mathematics	Calculus
Arts and Science elective	General Chemistry	English II
Biology	Biology	Arts and Sciences elective
English I	Professional Dynamics in the Health-Care Delivery System	General Chemistry
	Toxicology Orientation	

In addition to the above courses, students may choose to take Basic ROTC.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
Math*	4	Microbiology	4
Calculus*	8	Biostatistics and Computers†	4
General Chemistry*	10	Identification of Organic Compounds	3
English*	8	Instrumental Analysis	5
Biology*	8	Electives	28
Physics†	8	Middler-Year Writing Requirement	1
Organic Chemistry†	10		
Environmental Problems†	4		
Anatomy-Physiology†	10		
General Biochemistry	5		

* These courses are usually taken in the freshman year.
† These courses are usually taken in the sophomore year.

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Pharmaceutical Analysis	4	Public Health	4
Medicinal Chemistry/Pharmacology I, II, III	16	Epidemiology	4
Pathology	4	Basic MLS Clinical Chemistry and Instrumentation	5
Toxicology I, II, III	12	Professional Dynamics in the Health-Care Delivery System*	4
Pharmacology Laboratory I & II	2	Biopharmaceutics	4
Toxicology Laboratory	3		
Drug Interactions	4		

* These courses are usually taken in the freshman year.

Respiratory Therapy Program

Thomas A. Barnes, Ed.D., *Associate Professor and Director*

Associate Professors

Patrick F. Plunkett, Ed.D.

Mary E. Watson, Ed.D.

Assistant Professor

Glen J. Low, M.Ed.

Degree Offered: Bachelor of Science in Respiratory Therapy

Respiratory therapy is an allied-health specialty, instrumental in the diagnosis, treatment, management, and preventive care of patients with cardiopulmonary problems. These patients may be found in newborn nurseries, surgical and medical wards, emergency rooms, outpatient departments, and intensive care units of hospitals. They may be suffering from a variety of acute and chronic conditions that are either life threatening or disabling.

Professional Preparation

Respiratory therapists are involved in the treatment of cardiac and pulmonary disorders such as cardiac failure, asthma, pulmonary edema, emphysema, cerebral thrombosis, drowning, hemorrhage, and shock. With the assistance of sophisticated ventilators and monitoring equipment, respiratory therapists are an essential part of the critical-care team. Respiratory therapists are responsible for life support of the patient through airway management, artificial ventilation, external cardiac massage, and many other sophisticated emergency support measures. In essence, the respiratory therapist is a life-support specialist.

Routine patient care is also important. Working under physician's orders, respiratory therapists carry out specific therapeutic measures to assist respiratory-distressed patients. Respiratory

therapists must be experts in providing and recommending specialized modalities of respiratory care. They must be competent in such areas as medical gas administration, including oxygen; humidification, aerosols, and intermittent positive pressure breathing (IPPB); chest physiotherapy, cardiopulmonary resuscitation, mechanical ventilation, airway management, and pulmonary function studies; blood gas analysis; and physiologic monitoring.

Today, the field of respiratory technology is expanding rapidly to keep pace with the demand for new techniques to cope with environmentally related problems such as smoking and air pollution. New techniques also have been developed for use in the treatment of respiratory failure following open heart and other types of major surgery.

The Five-Year Major

Students enter the College of Pharmacy and Allied Health Professions as majors in the respiratory therapy program. Mathematics, chemistry, and the physical, biological, medical, and health sciences offer the bases for professional instruction in respiratory therapy. English, psychology, and elective courses in the humanities and social sciences offer a liberal arts background. Clinical study at the major teaching hospitals provides the opportunity for direct patient care and the immediate application of highly specialized techniques. The curriculum leads to the Bachelor of Science degree in Respiratory Therapy and includes academic quarters at the University, a structured clinical program, and assigned co-op quarters. Successful completion of the first three years of the program makes students eligible for the first part of the examinations administered by the National Board for Respiratory Care.

Two accelerated programs in Respiratory Therapy and Cardiovascular Perfusion Technology are available for professionals with a baccalaureate or master's degree who are interested in a new career. Students who meet the admissions requirements will have the science background needed to master professional courses in the curriculum. The curriculum allows students to integrate didactic, laboratory, and clinical practice courses over a twelve- to fifteen-month period of time. Graduates of the Certificate Programs are eligible to take the National Board Examination for Registered Respiratory Therapists or Certified Cardiovascular Perfusionists.

Accreditation

Both the degree and accelerated programs are accredited by the Committee on Allied Health Education and Accreditation sponsored by the American Medical Association.

Sample Freshman-Year Program

First Quarter	Second Quarter	Third Quarter
English I	Mathematics	Microbiology
General Chemistry	Respiratory Therapy Seminar II	General Chemistry
Basic Animal Biology	Basic Animal Biology	Respiratory Therapy Seminar III
Respiratory Therapy Seminar I	Physics	Arts and Science elective
Mathematics	Professional Dynamics in the Health-Care Delivery System	English II

Basic Course Requirements

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Biology	8	Pharmacology	4
Anatomy and Physiology	10	English Composition and Literature	8
Microbiology	4	Arts and Sciences electives	28
General Chemistry	10	Middler-Year Writing Requirement	1
Organic Chemistry	10		
Physics	4		
Mathematics	8		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Respiratory Therapy Seminars	3	Introduction to Pediatric Respiratory Care	2
Clinical Seminars	2	Cardiopulmonary Lab Techniques	3
Advanced Clinical Seminars, I, II, III, IV	4	Cardiopulmonary Lab Practice	1
Professional Practice Labs I, II, III, IV	4	Clinical Practice I	6
Cardiopulmonary Physiology	4	Clinical Practice II	6
Advanced Clinical Physiology	4	Advanced Life Support Systems I	4
Pathology	4	Advanced Medical Monitoring	4
Introduction to Patient Care	4	Respiratory Care for the Neonatal Patient	4
Introduction to Respiratory Care	4	Cardiopulmonary Diseases	4
Respiratory Care for the Med-Surgical Patient	4	Practicum in Critical Care I & II	8
Moral Problems in Medicine	4	Directed Study I & II	4
Respiratory Care for the Critical Patient	4	Professional Dynamics in the Health-Care Delivery System	4
		Professional elective	8

Health-Care Curriculum

Open Option Program

Students interested in pursuing a career in the health-care professions who are undecided as to which profession is right for them should explore the Open Option offered by College of Pharmacy and Allied Health Professions.

The Open Option program offers freshmen a core of courses designed to provide the basic scientific background required for each of the professional programs in the College of Pharmacy and Allied Health Professions. Students are also introduced to the basic principles of health-care delivery, health-care agencies and services, and attitudes, behavioral aspects, and policies that may influence health-care systems.

The Open Option is especially valuable to students who need assistance in determining an area of interest within the health-care field. By examining various professions, and thus gaining an overview of the discipline, students can refine their health-care career goals. They may also familiarize themselves with what is expected of them in various health-care professions. Subsequent selection of a professional program may proceed more smoothly, an advantage that may help students gain more confidence and certainty in pursuing a degree. Even though in the Open Option students consider various health professions, they also complete some of the prerequisite courses required of all the professional programs; thus they do not lose valuable time prior to selecting a major.

Open Option Courses

In this plan, students may complete the core courses in the first-year curriculum without selecting a profession in which to major and without loss of valuable time. Upon satisfactory completion of the first year of courses, students select a professional area in which to major. Professions in the College include pharmacy, health record administration, medical laboratory science, respiratory therapy, and toxicology.

The courses offered in the first-year Open Option include:

- Fundamentals of Mathematics
- Functions of Basic Calculus
- General Chemistry I and II
- General Biology
- Animal Biology
- Freshman Writing
- Introduction to Literature
- Professional Dynamics in the Health-Care Delivery System

Satisfactory completion of the nine courses in the Open Option core curriculum, as well as other courses completed during the freshman year, is necessary for admission to one of the professional programs of the College.

The Open Option plan does not apply to the dental hygiene program.

Dental Hygiene Program

Degree Offered: Associate in Science in Dental Hygiene

The Forsyth School of Dental Hygienists conducts a program of dental hygiene education in cooperation with Northeastern University. Students in this two-year program attend classes at both the Forsyth Dental Center and Northeastern. The dental hygienist is licensed to render preventive services to a patient under the supervision of a dentist, including administering dental prophylactic treatment, preparing dental radiographs, and teaching prescribed methods of maintaining dental health.

The Two-Year Program

The first year includes courses in anatomy and physiology, chemistry, microbiology, histology, nutrition, dental materials, radiology, periodontology, dental hygiene, and clinical dental hygiene instruction. In the second year, students take general courses, such as English, sociology, and psychology, and professional courses in pathology, public health, pharmacology, dental hygiene, and head and neck anatomy; they also continue to receive clinical dental hygiene instruction.

Degree

Students satisfactorily completing the program will receive the Certificate in Dental Hygiene from Forsyth and may elect to receive the Associate in Science degree in Dental Hygiene from Northeastern University. Graduates are required to fulfill the dental hygiene licensure requirements in the state in which they intend to practice.

Accreditation

This program is accredited by the Commission on Dental Accreditation of the American Dental Association.

Admissions

Application should be made directly to the Forsyth Office of Admissions at 140 The Fenway, Boston, Massachusetts 02115. For an application and a copy of the college catalog, contact the Office of Admissions at the above address or call 617-262-5200, extension 212 or 213.

Bachelor of Science Degree Programs in Health Science or Education

Graduates of the associate in science degree program for dental hygienists may apply to University College of Northeastern University, which offers part-time day and evening courses leading to a Bachelor of Science degree in Health Science.

Graduates interested in health education may apply to transfer into the third year of the bachelor of science degree program in education offered by Northeastern University's Boston-Bouvé College of Human Development Professions.

Sample Freshman-Year Program for the Associate Degree

First Quarter

Human Anatomy and
Physiology I
General Chemistry I
Dental Anatomy
Radiology
Dental Hygiene
Clinical Dental Hygiene

Second Quarter

Human Anatomy and
Physiology II
General Chemistry II
Histology
Periodontology I
Dental Hygiene
Clinical Dental Hygiene

Third Quarter

Microbiology
Dental Materials
Periodontology II
Nutrition
Dental Hygiene
Clinical Dental Hygiene

Basic Course Requirements for the Associate Degree

I. General Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English Composition and English Literature†	8	Sociology†	4
Chemistry*	8	Human Anatomy and Physiology*	10
Microbiology*	4		
Foundations of Psychology I†	4		

II. Professional Requirements

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Dental Anatomy*	2	Periodontology*	4
Radiology*	2	Public Health†	2
Dental Hygiene**	12	Pharmacology†	2
Clinical Dental Hygiene**	23	Head and Neck Anatomy†	2
Nutrition*	2	Dental Materials*	2
Histology*	2	Independent Study†	2
Pathology†	4		

* These courses are usually taken in the first year.

† These courses are usually taken in the second year.

** These courses are usually taken in both the first and second years.

Basic College Compensatory Programs

The Basic College Compensatory Education Program* generally encompasses six courses, each bearing four quarter hours of credit, which are to be offered in the sequences indicated below. Certain freshmen may be assigned to any one of these course sequences as applicable on the basis of testing administered during orientation week, precollege academic credentials, or, in English, performance in C ENG 1110, Freshman English I.

Fall**

C MTH 1000 Mathematical Preliminaries I

C ENG 1110 Freshman English I***

or

C ENG 1013 Fundamentals of English I

E ED 1003 Reading-Study Skills

Winter**

C MTH 1010 Mathematical Preliminaries II

C ENG 1014 Intensive Writing

Specifically, C MTH 1000 and C MTH 1010 are to precede both the C MTH 1106, C MTH 1107, and C MTH 1108 (nonbusiness math) sequence and the C MTH 1113, and C MTH 1114, and C MSC 1199 (business math) sequence. Certain freshmen may be assigned to C ENG 1013 and C ENG 1014 as applicable on the basis of precollege academic credentials, or may be assigned to C ENG 1014 (Intensive Writing) on the basis of their performance in C ENG 1110 (standard Freshman English I). Students must earn a standard passing letter grade in C ENG 1014 or C ENG 1110 to proceed into C ENG 1111 (standard Freshman English II), the C ENG 1111–C ENG 1113 sequence for engineers, and, in the case of the School of Engineering Technology, the C ENG 1111–C ENG 1114 sequence.

* For native English speakers; non-native speakers should see p. 256, English as a Second Language Proficiency Requirement.

** The same sequence is offered Winter/Spring for freshmen who enter in January.

*** Students whose work in this course is unacceptable for success in C ENG 1111, Freshman English II, will receive a grade of "S" and must complete C ENG 1014.

Schedule for Continuation of Compensatory Programming in the Basic Colleges	These courses are approved/disapproved for credit, except where noted, by the faculties of the individual colleges and are, there- fore, subject to change.				
	C ENG 1110 or C ENG 1013* English I	C ENG 1014 English II	C MTH 1000* Math Prelim. I	C MTH 1010* Math Prelim. II	E ED 1003 Reading/ Study Skills
Arts and Sciences	accepted	accepted	accepted	accepted	accepted
Bouvé Physical Therapy	accepted	accepted	not accepted	not accepted	not accepted
Bouvé Physical Education	accepted	accepted	accepted	accepted	accepted
Bouvé Rec. and Leis. Stud.	accepted	accepted	not accepted	not accepted	not accepted
Bouvé Health Education	accepted	accepted	accepted	accepted	accepted
Bouvé Teacher Prep.	accepted	accepted	accepted	accepted	accepted
Business Administration	accepted	accepted	accepted	accepted	not accepted
Computer Science†	accepted	accepted	not applicable	not applicable	not applicable
Criminal Justice	accepted	accepted	accepted**	accepted**	accepted
Engineering†	not applicable	not applicable	not applicable	not applicable	not applicable
School of Engineering Technology	accepted	accepted	not applicable	not applicable	not accepted
Nursing	accepted	accepted	not accepted	not accepted	not accepted
Pharmacy and Allied Health Professions	accepted*** w/o credit	accepted	not accepted	not accepted	not accepted

* Graded pass-fail and therefore not included in the student's quality-point average.

** Freshmen in the College of Criminal Justice are not required to take a mathematics course in the freshman year. However, if need for compensatory mathematics is substantiated by a diagnostic examination, students can elect to take C MTH 1000 or C MTH 1010 to prepare themselves for C MTH 1106 Fundamentals of Mathematics as upperclassmen.

*** Although the College of Pharmacy and Allied Health Professions does allow C ENG 1013 or C ENG 1110 (with a grade of S) to appear on the permanent record, it will only allow C ENG 1110 or C ENG 1014 (with a letter grade) for credit. Students completing the C ENG 1110-C ENG 1014 or C ENG 1013-C ENG 1014 sequence will have to make up the four-credit elective that was displaced by C ENG 1110 or C ENG 1013.

† Although the Colleges of Engineering and Computer Science do not allow C MTH 1000 or C MTH 1010 to be taken for academic credit, they do offer a special course sequence in college calculus with algebra and trigonometry (C MTH 1120 and C MTH 1121) for engineering freshmen judged to have deficiencies in mathematics. The courses involve students in extra hours of work in algebra and trigonometry, but cover the same material as do the regular freshman calculus sequences in the Colleges of Engineering and Computer Science.

University College

(Alternative Freshman-Year Program)

Program Goals

Students in the Alternative Freshman-Year Program are considered regular students and are degree candidates with an undeclared major. The Alternative Freshman-Year Program is specifically designed to help students strengthen their basic academic skills in writing and mathematics. While helping them gain confidence in their ability to do college-level work, the program also offers students an opportunity to consider several different areas of study before committing themselves to a specific major. Through the combination of a carefully prescribed curriculum and the attention of professional counselors, each student is helped to establish a program suited to his or her individual needs. These same counselors are normally available on a continuing basis throughout the student's entire freshman year.

Developed in collaboration with University College, a division of Northeastern University serving students who seek a flexible college program, the Alternative Freshman-Year Program has a proven record of success in assisting students to develop their full potential.

Program Structure

Students in the Alternative Freshman-Year Program begin with 10 to 16 quarter hours of credit in their first academic quarter. In their second and third quarters, students in most tracks accelerate their schedules to take 16 quarter hours of credit per quarter. Students in the health sciences track take 17 quarter hours in their second quarter and 13 quarter hours in their third quarter.

After completing the prescribed Alternative Freshman-Year Program and achieving both a cumulative quality-point average of 1.400 or better and specific program requirements as noted, students may continue their degree programs within University College or transfer, with sophomore status, to any program in the College of Business Administration or the College of Criminal Justice as well as certain nonscience programs in the Boston-Bouvé College of Human Development Professions and the College of Arts and Sciences. In addition to the cumulative quality-point average of 1.400 or better, the College of Business Administration requires a 1.800 average in four key courses—MTH 1113, ENG 4014, ECN 4601, and MGT 4110. Additional program requirements for students who would like to be admitted to sophomore status in the College of Pharmacy and Allied Health Professions are listed in the *Student Handbook* for Basic Colleges.

Faculty and Resources

The University has carefully selected for the Alternative Freshman-Year Program faculty members who are aware of individual student goals as well as the needs of students working to adjust to a college program. Faculty and students meet in small classes of not more than twenty-five students.

As members of the program, students are considered regular Northeastern University day students even though they have unique schedules and a distinctively tailored curriculum. Therefore, they generally have access to all counseling services, physical education facilities, dormitory arrangements, and extracurricular programs at the University's main campus in Boston.

Alternative Freshman-Year students are encouraged to make extensive use of the up-to-date programmed learning resources available for self-instruction through Northeastern's Learning Resources Center on the Boston campus. For additional assistance, Alternative Freshmen are also frequently referred to the Academic Assistance Center and/or the Math/Writing Center on the Boston campus. A third and very important resource, the Counseling and Testing Center, is also available to students on both the Boston and Burlington campuses for personal and academic counseling, as well as for vocational testing and counseling.

University College Alternative Freshman-Year Program

Sample One-Year Program: Business Track

First Quarter		Second Quarter		Third Quarter	
<i>No./Course</i>	<i>Q.H.</i>	<i>No./Course</i>	<i>Q.H.</i>	<i>No./Course</i>	<i>Q.H.</i>
CI 4003/Integrated Language Skills A	4	CI 4004/Integrated Language Skills B	4	ECN 4601/Economics 1 (or Directed Elective)**	4
ENG 4013/Fundamentals of English	4	ENG 4014/Fundamentals of English 2	4	HST 4111/History of Civilization B	4
MTH 1000/Math 1*	4	MTH 1010/Math 1*	4	MGT 4110/Survey of Business and Management	4
HST 4110/History of Civilization A**	(4)	HST 4110/History of Civilization A (or Economics 1)**	4	MTH 1113/Mathematics for Business*	4
Total Quarter Hours	12–16	Total Quarter Hours	16	Total Quarter Hours	16

* Students will be placed in one of three math courses depending on placement test results. Those receiving advanced placement have the option of completing MTH 1114 during freshman year.

** Eligible students may take HST 4110 in the first quarter, followed by ECN 4601 in the second quarter. Most students will take HST 4110 in the second quarter and ECN 4601 in the third quarter.

Sample One-Year Program: Criminal Justice, Education, or Arts and Sciences Track

First Quarter		Second Quarter		Third Quarter	
<i>No./Course</i>	<i>Q.H.</i>	<i>No./Course</i>	<i>Q.H.</i>	<i>No./Course</i>	<i>Q.H.</i>
CI 4003/Integrated Language Skills A	4	CI 4004/Integrated Language Skills B	4	HST 4111/History of Civilization B	4
ENG 4013/Fundamentals of English 1	4	ENG 4014/Fundamentals of English 2	4	POL 4106/Introduction to Politics	4
MTH 1000/Math 1*	4	HST 4110/History of Civilization A**	4	SOC 4011/Sociology 2 (or Directed Elective)	4
HST 4110/History of Civilization A**	(4)	SOC 4010/Sociology 1	4	Directed Elective†	4
Total Quarter Hours	12–16	Total Quarter Hours	16	Total Quarter Hours	16

* Students will be placed in one of two math levels, depending on placement test results.

** Eligible students may take HST 4110 in the first quarter, followed by an elective in the second quarter. Most students will take HST 4110 in the second quarter.

† The Directed Elective is to be chosen with consideration for the student's intended major.

Sample One-Year Program: Health Sciences Track

First Quarter		Second Quarter	
<i>No./Course</i>	<i>Q.H.</i>	<i>No./Course</i>	<i>Q.H.</i>
MTH 1010/Math 2	4	MTH 1106/Fundamentals of Mathematics	4
ENG 4013/Fundamentals of English 1	4	CHM 1111/General Chemistry 1	5
CHM 1110/Pre-Chemistry	5	CI 4002/Integrated Language Skills Development 2	2
CI 4001/Integrated Language Skills Development 1	2	ENG 4014/Fundamentals of English 2	4
Total Quarter Hours	15	Total Quarter Hours	15
Third Quarter		Fourth Quarter	
<i>No./Course</i>	<i>Q.H.</i>	<i>No./Course</i>	<i>Q.H.</i>
BIO 1140/Basic Animal Biology 1	4	BIO 1141/Basic Animal Biology 2	4
CHM 1112/General Chemistry 2	5	MTH 1107/Functions and Calculus	4
Directed Elective	4	Directed Elective	4
Directed Elective	4		
Total Quarter Hours	17	Total Quarter Hours	12

Tuition and Fees	Tuition and fees for the Alternative Freshman-Year Program are the same as for students in the Basic, or Day, Colleges. Payment of the standard tuition during the first three academic quarters of residence entitles students to 48 credit hours of instruction. Thus, those who take the 40 programmed credits are entitled to an eight-quarter-hour tuition adjustment at the regular freshman rate.
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Application Procedures	<p>For further information on the Alternative Freshman-Year Program, or to request an application, please write or call:</p> <p>Department of Undergraduate Admissions Northeastern University 360 Huntington Avenue Boston, Massachusetts 02115 Telephone: 617-437-2200</p>
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University College

Part-Time Evening Programs

University College is committed to the education of mature adult students who wish to live effectively in today's complex society. The College's programs are constantly evaluated and updated to satisfy the changing professional, cultural, and social needs and interests of adults.

Undergraduate degree programs have been developed in over thirty major fields of study in the areas of business administration, health professions and sciences, law enforcement, and liberal arts. Courses are offered on a convenient, part-time basis throughout the week, during the day and the evening. Students may take single courses, pursue a certificate program, or enroll in full degree programs leading to the associate's or bachelor's degree. Short-term seminars are also offered for credit. Classes are scheduled at a number of accessible locations.

Academic advisers are available to talk with students about courses, transfer credit, degree requirements, and other matters of individual concern. University College advisers are present at the Boston and Burlington campuses weekdays, by appointment.

At all other branch campuses, advisers are available by appointment on the evenings classes are in session. For an appointment at the Burlington campus, call 617-272-5500. For appointments at all other campuses, call 617-437-2400. During registration, advisers are available at all campuses to answer general questions. There is no charge for this service.

University College also offers a variety of career and other support services to its students, including a career-development course, job-search seminars, and counseling, testing, and placement services.

For a copy of the current University College *Bulletin*, please write or call: University College, Northeastern University, 360 Huntington Avenue, Boston, Massachusetts 02115, telephone 617-437-2400.

Full-Time Day Programs

In addition to offering a variety of part-time undergraduate programs, University College also offers a full-time day program in allied health—the Radiologic (X-ray) Technology Program. The admission procedure for this program differs from those of other programs in University College. Therefore, individuals interested in this program are advised to call or write for further information to the program office listed on page 231.

Radiologic (X-ray) Technology Program

Professional Preparation

Aims

The radiologic technologist is an important member of any health care team. Combining a technical background with extensive training and skills, the radiologic technologist is trained to use X-rays to produce a clear picture or radiograph of a patient's tissue, bone, or organ structure for evaluation and interpretation by a physician. Northeastern University's Radiologic (X-ray) Technology Program is designed to offer students the opportunity to prepare for entry-level employment opportunities as radiologic technologists.

A View of the Program

The Radiologic (X-ray) Technology Program at Northeastern offers a combination of academic preparation and clinical experience. Enrolling a new class of students in September of each year, the program consists of lecture and laboratory sessions held at Northeastern and periods of clinical training at selected radiology departments in Massachusetts hospitals. The program requires twenty-nine months of continuous study. A two-week orientation period is held prior to the beginning of classes each September.

Degree

Upon satisfactory completion of the program, students receive an Associate in Science degree and are eligible to sit for the American Registry Examination for certification as radiologic technologists.

Graduates may, if they wish, seek career opportunities in the diagnostic environments of clinics and hospitals. However, they may also explore opportunities for employment in production and quality control in industrial firms. Graduates may also decide to consider a program in radiation therapy, nuclear medicine, or ultrasound technology, or may choose to continue their education by applying for acceptance to a bachelor's degree program in health science or health management.

Accreditation

This program is accredited by the Committee on Allied Health Education and Accreditation of the American Medical Association and by the American Registry of Radiologic Technologists.

Application

For further information regarding the Radiologic (X-ray) Technology Program, or to request an application for admission, please contact:

Radiologic (X-ray) Technology Program
University College
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone: 617-437-2818

School of Engineering Technology

In addition to full-time curricula described earlier in this bulletin, the School of Engineering Technology offers interdisciplinary programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs provide educational opportunities for students who must pursue full-time employment but who desire to initiate or continue their academic work.

The part-time evening program includes pretechnology preparatory courses and degree programs leading to the associate in engineering (A.E.), the associate in science (A.S.), and the bachelor of engineering technology (B.E.T.). The A.E. degree may be earned in computer technology and architectural, environmental, structural, surveying and highway, electrical, and mechanical engineering technology. The A.S. degree may be earned in telecommunications and energy systems. Those students seeking further education may earn the B.E.T. degree in computer technology and mechanical, electrical, mechanical-structural, and civil engineering technology.

Graduate and Professional Schools

The following graduate and professional schools of the University offer day and evening degree programs.

Arts and Sciences

The master of arts degree may be earned in economics, English, history, journalism, political science, psychology, sociology, and social anthropology. The master of science degree is available in biology; chemistry; economic policy and planning; law, policy, and society; mathematics; and physics. The master of science in health science; the master of journalism in news media management; the master of public administration; and the master of technical and professional writing degrees are also offered. In addition students may earn the certificate of advanced graduate study in the program of advanced literary study. The doctor of philosophy degree is available in biology; chemistry; economics; law, policy, and society; mathematics; physics; psychology; and sociology. There is also available an interdisciplinary program in clinical chemistry. Two non-degree options are also available: certificate in economics of manpower and development planning; and certificate for technical writing internship training program. Most programs may be completed through either full- or part-time study.

Boston-Bouvé College of Human Development Professions

The master of science degree may be earned, with specialization in counseling psychology, physical education, physical therapy, speech-language pathology and audiology, or recreation management. Programs may be completed through full- and part-time study.

The master of education degree may be earned with specialization in curriculum and instruction, educational research, human development, industrial and career counseling, rehabilitation, special education, and school and college student personnel counseling. The certificate of advanced graduate study is offered in counseling, educational administration, and rehabilitation. The doctor of education degree may be earned in leadership: administration and supervision with specialization in the practice of counseling psychology, educational administration, or rehabilitation.

Business Administration

A master of business administration degree may be earned. The Graduate School of Business Administration offers a variety of programs to meet the needs and schedules of graduate business students. Two full-time program alternatives are offered: a twenty-one-month Cooperative Education M.B.A. Program, which includes a six-month, paid professional work assignment; or a two-year traditional full-time program, which may include administrative or teaching assistantship opportunities. Individuals who wish to continue their full-time job responsibilities while earning an M.B.A. degree may consider the evening part-time program of study, the eighteen-month executive M.B.A. program for upper-level managers, or the accelerated part-time high technology M.B.A. for qualified technical professionals.

The master of science degree in professional accounting is an intensive, full-time program specifically designed for liberal arts and other nonaccounting majors.

In addition, there is a nondegree program for advanced study in business administration leading to the certificate of advanced study in business administration.

Also within the College of Business Administration, the Center for Management Development offers several intensive, graduate-level programs designed to provide professional growth and to improve the overall performance of experienced managers. Based on a modification of the Northeastern University cooperative education format, these programs permit company-sponsored participants to maintain their job responsibilities during periods of classroom instruction.

The center's program offerings include: the Management Development Program, The Management Workshops, and the Smaller-Business Executive Program. (See the Center for Management Development for program details, page 235.)

Computer Science

The College of Computer Science offers both full- and part-time programs leading to a master of science degree in computer science. Students may specialize in theory, systems, software, data bases, artificial intelligence, communications and networks, or interactive systems design.

Criminal Justice

The College of Criminal Justice offers both full- and part-time programs leading to a Master of Science degree in Criminal Justice. Students enrolled in the Master of Science program in criminal justice may choose from among several areas of specialization: administration and planning; criminology and research; security administration; and a multi-disciplinary concentration developed with a faculty member to suit the individual's needs.

Engineering

The master of science degree may be earned, with specification in the field of chemical engineering, civil engineering, computer systems engineering, electrical engineering, industrial engineering, engineering management, information systems, or mechanical engineering. A special five-year honors program in mechanical, industrial, or electrical engineering is offered, leading to both bachelor's and master's degrees; the professional engineer degree in mechanical, industrial, or electrical engineering; the doctor of engineering degree in chemical engineering; and the Ph.D. degree in chemical, civil, electrical, industrial, or mechanical engineering. A special interdisciplinary program leading to the master of science in transportation is also offered.

Law

The School of Law offers a full-time program of professional instruction, leading to the degree of juris doctor (J.D.). It is fully accredited by the American Bar Association and is a member of the Association of American Law Schools. There are no courses for part-time or evening students.

Unique among American law schools, Northeastern's School of Law features cooperative legal education. Under this plan, each student works full-time at law for participating employers for four calendar quarters during his or her second and third years, alternating with equal periods of full-time course work. This blending of academic study and practical legal work experience, after a traditional first year of intensive academic study, is designed to offer the best possible preparation for the actual practice of law. Cooperating employers include large and small private firms, government agencies, legal assistance and public defender organizations, judges, unions, corporate law departments and virtually every type of legal practitioner. Employers are located nationwide.

Because the school operates twelve months a year, students complete the program on the same schedule as more traditional schools.

Pharmacy and Allied Health Professions

The master of science degree is offered on a part-time and full-time basis in biomedical science, clinical chemistry, hospital pharmacy, medical laboratory science, medicinal chemistry, and pharmacology. The master of health professions is also offered with the following options: general, health policy, physician assistant,

and regulatory toxicology. The Ph.D. degree is offered in biomedical science with specialization in medical laboratory science, medicinal chemistry, pharmaceutical science, pharmacology, and toxicology. The clinically oriented doctor of pharmacy (Pharm.D.) degree is offered as a full-time program to graduates of accredited colleges of pharmacy.

Professional Accounting

The master of science degree in professional accounting is a full-time, highly concentrated 15-month program, designed for arts and sciences and other nonaccounting majors who are interested in careers in professional accounting. The five-quarter course includes a three-month internship with a leading CPA firm in the middle or winter quarter, thus providing both practical experience and financial support. New classes start in mid-June of every year.

The Center for Management Development

Sponsored by the College of Business Administration, the Center for Management Development offers programs designed to provide opportunities for professional growth for middle and senior managers. The programs scheduled throughout the academic year, include the Management Development Program, the Management Workshops, and the Smaller Business Executive Program. Participants are sponsored by their employers.

The Management Development Program is a graduate-level course in business for managers who have had responsibility for a major task, function, department, division, or independent enterprise. Six weeks of in-residence instruction are extended over a period of several months (October to February, January to May, or March to June). All sessions are scheduled at Phillips Academy in Andover, Massachusetts.

The Management Workshops offer middle-level managers comprehensive study in major areas of business through three different programs of graduate-level content. Scheduled at Northeastern's executive education facility in Dedham, Massachusetts, The Management Workshop I, The Management Workshop II, and The Management Workshop—High Tech are each held one day per week (Fridays or Mondays) for either ten or twelve consecutive weeks during the September-to-June period.

The Smaller Business Executive Program focuses on particular areas of interest to senior executives of the smaller firm. Held at Phillips Academy in Andover, MA, the program is scheduled once each year for two in-residence sessions, one month apart.

The Center also designs and conducts special programs for a wide range of business organizations, either for in-house implementation or at a Northeastern executive education facility. The Center for Management Development can be reached at 617-437-3272.

The Center for Continuing Education

The Center for Continuing Education was established so that the University could meet the educational needs of the community through a wide range of workshops, conferences, seminars, forums, and special training programs. These are offered in such areas as business, building technology, emergency medical training, graphic arts, health, management, nursing, paralegal studies, and test preparation courses for the SAT, GMAT, LSAT, and GRE examinations. For more information, write or call the Northeastern University Center for Continuing Education, 370 Common Street, Dedham, MA 02026. Telephone: 617-329-8000.

Insurance and Financial Services Institute

The Insurance and Financial Services Institute was established to foster excellence in the insurance and financial services communities in the Boston area. It offers a number of courses in preparation for the chartered life underwriter and chartered property-casualty underwriter designations as well as programs in general insurance, risk management, insurance licensing, and NASD Series 7 and 63. The Institute also offers a number of seminars designed to address timely issues in both the insurance and financial services professions. For more information, call or write the Northeastern University Insurance and Financial Services Institute, 89 Main Street, Suite 203, Medway, MA 02053. Telephone: 617-533-5101.

State-of-the-Art Engineering

The State-of-the-Art Engineering program provides non-degree continuing education and professional development programs to practicing engineers, scientists, and managers employed in the high technology industry. Established in 1963, the program is now one of the nation's most comprehensive centers for technology transfer. With the goal of helping professionals stay abreast of rapid advances in their fields, the program reflects the most current technological developments. Over 150 courses and seminars are offered on leading-edge topics in computer engineering, telecommunications, microelectronics, and technical management. Many of the program's courses are broadcast live over Network Northeastern or conducted on-site at industrial locations.

Operating out of the New England Regional Technology Center at the Dedham campus, the State-of-the-Art Engineering program serves the Route 128 high technology community with courses offered at numerous suburban campus locations. The University launched a major expansion of the program in 1985 with the opening of the Bay Area Regional Technology Center in the heart of California's Silicon Valley. With facilities now located on both coasts, the State-of-the-Art program is well positioned to continue to meet the challenges of America's high tech industry.

Network Northeastern

Network Northeastern represents the University's entry into the age of education by telecommunications. Developed to serve the needs of the high technology community for flexible educational and training programs, Network Northeastern broadcasts live instruction from the University campus directly to company sites and the Burlington and Dedham campuses. Live classroom instruction is telecast in color to these remote sites where it is viewed in reception rooms equipped with television monitors and a telephone talkback system. Videotapes for missed classes are provided, and a courier service delivers and collects homework assignments and serves as a link to the registrar, bookstore and other University services. The network offers courses in graduate engineering and computer science, undergraduate engineering technology, and state-of-the-art engineering. For more information, please call 617-437-5620.

Research, whether performed in the laboratory, library, or in the field, is vital to a college education. It stimulates all participants and ensures a thriving academic atmosphere. Through research, faculty members as well as students stay abreast of the most recent developments in their particular fields. Faculty who disseminate this knowledge through publishing, speaking, and teaching help assure a university education of the first order.

At Northeastern, research and scholarly endeavors are taken very seriously and are actively encouraged. Each year, the faculty receive funding for an ever-increasing number of research projects. Sponsorship comes from a variety of sources. Federal agencies, private industry and foundations, and the University itself all contribute to Northeastern's growing research emphasis.

While much of this research is carried out by the faculty members, their graduate students, and post-doctoral research associates, ample opportunities also exist for undergraduate students. Research participation can be included as part of regular academic programs, as specially designed independent studies, or through cooperative work assignments. Research activities are encouraged, and are limited only by the student's own motivation and curiosity.

Northeastern University has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institutes of Health Research Career Awards. Faculty members lecture the world over—from just across the Charles River in Cambridge, Massachusetts, to across the Pacific Ocean in Sydney, Australia.

Additionally, many faculty serve as United States government consultants and participate on a variety of national and international committees. At the same time, because Northeastern considers education its primary mission, students will always find an enthusiastic and accessible faculty to answer questions, solve problems, and stimulate enquiring minds.

Current research spans almost every academic and professional field and is not limited to laboratory investigations or the "hard" sciences. Every department of every college at Northeastern carries out some basic or applied research projects.

A brief summary of some of the topics presently under investigation by the faculty and students follows. Perhaps something here will spark hidden interests that students never realized they had. Students desiring to explore the opportunities for research participation should inquire at the appropriate departmental offices.

Arts and Sciences	In the College of Arts and Sciences research projects reflect the diversity of its nineteen departments. Research in the humanities and the natural and social sciences includes studies in nineteenth-century Boston architecture, the Off Off-Broadway theatre, biochemistry, quantum field theory, and infrared spectroscopy. The College's interdisciplinary interest in marine sciences is represented by the Marine Science and Maritime Studies Center where faculty and graduate students carry on research in marine chemistry, biology, and botany.
Engineering	Research in the College of Engineering encompasses some of today's most important technological subjects. Robotics, telecommunications, signal processing, electromagnetics, materials, and the theoretical aspects of computer engineering and graphics are some of the major fields of interest within the College. Not all studies are high technology oriented. Indeed, some faculty pursue projects dealing with the electrical properties of human blood vessels, while others investigate the mechanical characteristics of cement. These seemingly diverse research areas do have one thing in common, however: they deal with the improvement of our quality of life.
Computer Science	Northeastern University's new College of Computer Science represents one of today's most active technological fields. The research interests of the computer science faculty span artificial intelligence through the design of expert systems, graphics, VLSI software design systems, data base development, pattern recognition systems, software engineering, logic programming, encryptive schemes, and the design and analysis of novel backtracking algorithms.
Criminal Justice	The College of Criminal Justice stresses both theoretical and applied research. Lawyers, statisticians, social and behavioral scientists, systems specialists, and forensic scientists all serve on the faculty and participate in a myriad of research activities. Some research directions currently pursued by faculty include juvenile delinquency, contemporary police systems, private security, and terrorism.

Law	The School of Law's research activities concentrate on an investigation of the operation and impact of the legal system from a variety of interdisciplinary perspectives—including those of the historian, the economist, the social theorist, and the political scientist. Other research focuses on current legal issues and on the problems of communicating lawyering skills.
Boston-Bouvé	The nature of research in Boston-Bouvé College of Human Development Professions is broad in range and diverse in approach. Changes in human development and the roles of the teacher and clinician in facilitating such changes are topics of lively interest. Some of the current research interests of the College include the communication abilities of normal and hearing-impaired individuals, the role of exercise in cardiovascular health and disease, the evaluation of clinical practice in physical therapy, the evaluation of educational practices in the schools, and an examination of interdisciplinary approaches to services for the elderly.
Nursing	Research interests in the College of Nursing are directed toward its student population and the community at large. Other significant interests include cooperative education, issues affecting women (locally, nationally, internationally), the elderly, and the development of leadership skills in nurses who are employed in middle management positions.
Pharmacy and Allied Health Professions	Research objectives in the College of Pharmacy and Allied Health Professions have important ramifications for the nation's health. Studies include new ways to analyze antidepressant and anticonvulsant drugs, the development of protocols to improve the survival of organ transplants, the synthesis and <i>in vivo</i> action of drugs, and a study of current health policy laws and regulations. The National Institutes of Health, the Office of Naval Research, Eli Lilly Co., the American Heart Association, and the American Diabetes Association are among the sponsors of the College's work.
Business Administration	Research in the College of Business Administration is partitioned between the theoretical and practical aspects of accounting, finance, management science, general management, human resources, and marketing. New approaches in corporate practice and academic theory are being realized through conclusions reached by a faculty examining such topics as high technology

management, small business entrepreneurship, and foreign investment in developing countries. Other studies concentrate on transportation problems in the United States, government regulation in industry, and technological forecasting in the high technology industry. Significant work is also being done by the marketing faculty in the area of survey research.

**Research Centers and
Institutes**

The Cooperative Education Research Center was established to address the need for research in cooperative education and to respond to the information needs of the co-op community across the country. To fulfill these objectives, the Research Center conducts and reports a variety of research studies and maintains a large data base of current information about co-op programs and a clearinghouse of articles and reports on co-op.

Northeastern also has several interdisciplinary centers and institutes which do not grant degrees, but they perform a variety of interesting and relevant research. The Barnett Institute of Chemical Analysis and Materials Science has as its goal basic research in the fields of analytical chemistry and material science and its application to problems of social relevance. The Institute has developed an international reputation in the fields of chromatography, mass spectrometry, amorphous metals, and solar-energy storage devices. The Center for Electron Microscopy is a self-contained research unit that utilizes the latest scientific equipment for training and research in cellular and subcellular structures. The Center for Applied Social Research is a University-wide institute that deals with issues of public policy and social research. Projects are presently under way in the fields of criminal justice, public safety, mental health, social welfare, and education.

The Center for the Integration of Engineering and Manufacturing emphasizes a total systems approach involving the manufacturing process, the information process, and the control process. The Center for Electromagnetics Research represents a collaboration of the University, the National Science Foundation, the United States Air Force, and industrial sponsors. The research areas encompass microwave technology, electro-optics, plasmas, materials, computers and electromagnetics.

Support services for research are provided by the University's Office of Sponsored Programs, the Academic Computer Services, the Division of Laboratory Animal Medicine, and through the collections, reference, and online search services of the University libraries.



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Commitment to the Future

Undergraduate Admissions

Department of Undergraduate Admissions

139 Richards Hall
Telephone: 617-437-2200

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Mary A. Zammitti, M.Ed., *Associate Dean and Director*

Assistant Directors

Steven B. Bissell, B.S.

Michael F. Clifford, B.S.

Robert D. Hunter, M.Ed.

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Cornelius B. O'Leary, B.A.

Michael C. Perry, M.Ed.

Admissions Counselors

Jennifer G. Kilson, B.A.

Barry C. Reckley, B.S.

Admissions Fellows

Karin I. Brond, B.A.

Maura L. Connolly, B.S.

To find a college or university that will suit personal needs and interests—a place where a student can learn to feel at home and make sound preparation for a future career—is a goal of all students who plan to continue their education beyond secondary school. The goal can be achieved in a number of ways: by talking with enrolled students, faculty, and alumni; by reading catalogs; and by visiting college campuses. In fact, a college campus visit should be high on a prospective student's list of priorities. Northeastern's Committee on Admissions extends a cordial welcome to all prospective freshman and transfer students and has planned a series of on-campus experiences to make a visit as worthwhile as possible.

The Admissions Conference

Students have many questions about Northeastern—its programs of study, its services to students, and the Cooperative Plan of Education. For this reason, the Committee on Admissions sponsors a series of Orientation Conferences for students. Offered at 10:00 a.m. and 2:00 p.m. on Mondays and Fridays from October 1 through May 1 (except for legal holidays), these conferences have been most successful in helping students become better acquainted with the University. They include comments by an admissions counselor, an informal question-and-answer period, and a multimedia presentation.

Special sessions are also held in the summer between July 1 and September 1. Further information about these summer conferences may be obtained from the Admissions Department.

Guided Tours

Student-guided tours of the campus are usually held daily, Monday through Friday, at 11:00 a.m. and 3:00 p.m. The admissions conference and the tour should both be scheduled in advance by writing or calling the Undergraduate Admissions Office (617-437-2211). The opportunity to visit the University's facilities and to observe student life on campus is one important way to learn about Northeastern.

Although it is not required, a personal interview is generally regarded as an appropriate opportunity for students with special questions to meet with an admissions counselor. In studying the secondary school record, the counselor may discover some factor that merits further explanation. In this event, the applicant may be asked to arrange a visit to the Admissions Office. The interview may be held at the request of the student or the counselor. Contacts with Admissions personnel will be more beneficial if the Northeastern University *Bulletin* has been carefully read before the personal interview.

Special Note

Northeastern does not hold Saturday classes for students in the Basic Colleges; for that reason, guided tours cannot be provided at that time. A weekday visit to the University is recommended. However, special Saturday appointments may be arranged on a limited basis.

General Requirements for Entrance

An applicant for admission to Northeastern University has, ideally, completed a challenging secondary school program—a program that includes courses in *English*, *foreign language*, *mathematics*, *laboratory science*, and *history*. Proficiency in a foreign language is especially important for students entering the College of Arts and Sciences. But the overall school record has importance in itself, both as an indication of achievement in subjects critical to university study and as a reflection of a wise choice of electives. The high school transcript should provide clear evidence of sound study habits so vital to success in higher education. Candidates are also encouraged to broaden their reading outside of class. The student who can communicate ideas, understand the meaning of words, and write effectively is at a distinct advantage.

Today's high school students have had the advantage of many innovations that have greatly enriched their experience—independent study, small group seminars, research projects, and off-campus experiences related to community service or future vocations. Northeastern is understandably interested in the growth of the work/study concept in many secondary schools, and the Committee on Admissions looks favorably upon the variety of these worthwhile experiences.

Preparation for Study in Engineering, Computer Science, Science and Mathematics, and Allied Health Professions	<p>It is only natural that evidence of special aptitude and the highest possible level of preparation in the sciences and mathematics should be required for entrance to certain programs of study offered by the University. Such programs include:</p>
<p>College of Arts and Sciences Biology, Chemistry, Geology, Mathematics, Physics, Applied Physics</p> <p>Boston-Bouvé College of Human Development Professions Physical Education Physical Therapy School and Community Health Education</p> <p>College of Computer Science Bachelor of Science program</p>	<p>College of Engineering All programs</p> <p>School of Engineering Technology Bachelor of Engineering Technology program</p> <p>College of Nursing Bachelor of Science program</p> <p>College of Pharmacy and Allied Health Professions All programs</p>

Applicants are encouraged to complete a full sequence of science and mathematics courses if possible. In science, this would usually include a full academic year of study and laboratory work in *biology*, *chemistry*, and *physics*; and, in mathematics, *geometry*, *algebra 1 and 2*, and a fourth year of *trigonometry* and/or *analysis*. Experience has shown that applicants to programs emphasizing mathematics and science also need courses in the social sciences and humanities to be fully prepared for advanced study.

Preparation for Study in Business Administration	<p>Candidates for admission must have successfully completed a strong preparatory program in high school, including courses in <i>geometry</i>, <i>algebra 1</i>, and <i>algebra 2</i>. While mathematics plays an important role in the total program, strong emphasis is also placed on liberal studies to effect an intellectual balance with liberal and appreciative courses.</p>
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Preparation for Study in the Social Sciences, Fine Arts and Humanities, Teaching, and Criminal Justice	<p>Many candidates for admission have enjoyed their greatest success in areas other than mathematics-science. Their interests lie, quite naturally, in the study of the humanities and social sciences. Thus, such a student may choose to apply for admission to one of the following programs:</p>
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College of Arts and Sciences

In addition to the science programs listed, the College offers programs in Fine Arts and Humanities with majors in Art, Theatre and Dance, English, Journalism, Modern Languages, Music, Philosophy, and Speech Communication; and in Social Sciences with

majors in African-American Studies, Economics, History, Human Services, Linguistics, Political Science (including a concentration in Public Administration), Psychology, and Sociology/Anthropology.

Boston-Bouvé College of Human Development Professions

Students electing to major in early childhood education, elementary education, English as second language, human services or recreation and leisure studies should, through their high school courses, have demonstrated interest in the behavioral and social sciences.

College of Criminal Justice

By its very nature, the program in Criminal Justice requires a strong base of liberal arts study before professional courses are introduced. Applicants for admission should therefore demonstrate the ability to succeed in their study of the behavioral, social, and human services.

Entrance Examinations (Freshmen)

Research clearly indicates that the best single predictor of college academic success is achievement in secondary school. This factor, together with recommendations from the school counselor, weighs most heavily in the evaluation process. Although the Scholastic Aptitude Test and three Achievement Tests of the College Board are required, the Committee on Admissions recognizes that these test results do not measure such qualities as determination, imagination, and leadership.

English composition has to be one of the three required Achievement Tests. Students can choose the other two tests in subjects in which they feel most confident. Students whose native tongue is not English may substitute the Test of English as a Foreign Language (TOEFL) for the English Composition Test. No single schedule of testing is recommended, but applicants are advised to take subject matter tests while they are currently studying those subjects.

For full information about College Board Examinations, consult a school guidance counselor or write directly to:

The College Board
P.O. Box 592
Princeton, New Jersey 08540
or
P.O. Box 1025
Berkeley, California 94701

The American College Testing Program may be substituted for the College Board Testing Program. For full information, write to:

American College Testing Program
P.O. Box 168
Iowa City, Iowa 52243

Admissions counselors also will be glad to answer questions about these testing programs. Special testing arrangements can be made for handicapped applicants, and there are alternate admissions criteria for handicapped applicants unable to take the required tests.

Advanced Placement

The University grants advanced placement credit to those students with a score of 3 or better in their Advanced Placement Examinations. Students may take the examinations in the following subjects: art (studio art, history of art), biology, chemistry, computer science, English (language and composition, literature and composition), French (French language, French literature), German language, Government and politics (American, comparative), history (American history, European history), Latin (Vergil, Catullus-Horace), mathematics (calculus AB, calculus BC), music, (music listening and literature, music theory), physics (physics B, physics C), and Spanish (Spanish language, Spanish literature).

Applicants are required to take the Advanced Placement Tests of the College Board in May.

College-Level Examination Program

The University cooperates with the College Board in its CLEP Program. CLEP provides a national program of five General Examinations and thirty Subject Examinations to evaluate nontraditional college-level education. Qualified students are encouraged to take the general and/or subject matter examinations of CLEP, so that college credit may be allowed upon entrance. In general, the Committee on Admissions accepts the score range recommendations of the College Board. Northeastern University has been designated a CLEP Testing Center. Inquiries may be addressed to the Counseling and Testing Center, Room 302, Ell Student Center.

Applying for Admission and Plans of Admission

Entry Dates

Northeastern University admits qualified freshman students to all programs in September. The University also has a January entrance date for most of its programs. Entrance dates for transfer students vary by program; many admit students at the beginning of each of the four quarters.

The application should be filled out properly, signed, and forwarded to the Dean of Admissions, Northeastern University, Boston, Massachusetts 02115, together with a nonrefundable \$25.00 application fee. Checks should be made payable to Northeastern University. This fee may be waived in cases of extreme hardship as endorsed by the candidate's secondary school counselor or social worker. It is to the student's advantage to submit the application for admission promptly. Students are also responsible for making sure that their transcripts and College Board scores are submitted to the University.

Program Selection

Many students have difficulty in selecting a program of studies. For this reason, the University has introduced flexibility into its programs so that students may explore alternative fields or tailor their programs to personal goals. Freshman candidates have to indicate a choice of college and, in some cases, a major. In most colleges students do not have to make a definite choice of major concentration or emphasis until the end of the freshman year and in some programs until the end of the sophomore year.

Rolling Admission Plan

Under Northeastern's Rolling Admission Plan, decisions on admission are made as soon as all of the required credentials (including first marking period senior grades and College Board test scores) have been submitted and reviewed. In all cases of acceptance, candidates are to successfully complete their senior year of high school.

Students should note that enrollments are limited in some programs where the number of applications is expected to exceed campus resources.

Deferred Admission Plan

Accepted students who wish to participate in the Deferred Admission Plan will be asked to describe the activities they plan for the year preceding enrollment. Students may choose this plan for a variety of reasons that may include travel, health problems, or work. Information on the plan is available from the Department of Undergraduate Admissions.

**Early Admission—Juniors,
Second-Semester Seniors**

In certain cases, students may enroll at Northeastern prior to high school graduation. Such students may enroll either in September or January, thereby reducing the time to complete degree requirements by one year. A special form provided by the Admissions Committee requires the endorsement of the school principal or guidance counselor for early admission. Write to the Department of Undergraduate Admissions for further details.

University Honors Program

The University offers to qualified students in each of its Basic Colleges the opportunity to participate in a comprehensive honors program designed to foster and recognize superior intellectual development and achievements. Based upon criteria established by each College for its own majors, students may be invited into the program as they enter the University or at any point during their college careers. Students may be recommended also for participation in the program or in its individual components by their faculty advisers and/or the Honors Committee of the students' major college.

The program consists of both academic and non-academic components. A wide variety of special limited enrollment sections of many freshman- and sophomore-level required and elective courses are offered each quarter providing greater depth, sophistication, or extension than their regular equivalents. Once completed, these more challenging courses may be used to fulfill specified curricular requirements or may serve as electives. In addition, certain other courses have been organized to permit students to do individual advanced level work and receive an honors designation on their transcripts. Each year a selection of honors seminars are offered on interdisciplinary subjects for which honors students may enroll as part of their course load or as a free overload. Finally, junior-senior honors programs, based upon individual or small-group research projects under the direction of distinguished faculty, are available to qualified students.

Successful completion of any honors course is noted clearly on students' individual transcripts, and successful completion of the program's various academic requirements can result in Honors Program Distinction at graduation. The program makes some extra demands on participating students, but the smaller and more homogeneous class composition, the heightened levels of student-faculty interaction, and challenging intellectual content combine to make the University Honors Program an especially stimulating educational opportunity.

Beyond the courses themselves, honors students may avail themselves of a wide variety of opportunities and services. These include eligibility for university honors scholarships; liaison with the Cooperative Education Department; honors housing options; honors faculty advisers; individualized course selection and registration privileges; a designated honors lounge and computer-equipped study area; and a range of social and cultural activities including speakers and film series, colloquia, and trips of various kinds.

For further information concerning entry into the program, contact the Department of Undergraduate Admissions. For infor-

mation concerning the College's criteria for entry into and retention within it, students should contact The Honors Program, 203 Lake Hall, Northeastern University, 360 Huntington Avenue, Boston, MA 02115. Telephone: 617-437-2333

Carl S. Ell Scholars Program

The University's Carl S. Ell Scholar award provides recognition to students for their high academic achievement.

Each year twenty-five freshman students are selected for this academic achievement award. The scholars are awarded full freshman-year tuition scholarships, and those who maintain a superior scholastic average during their years at Northeastern are awarded one-half tuition grants for each subsequent year. In addition to receiving financial assistance, the scholars are invited to join the Ell Scholars Association in their freshman year. The association endeavors to build a community of scholars within the University by providing a forum for intellectual exchange. Students are usually notified of their selection before February 1.

B.A. or B.S./Juris Doctor (J.D.) Degree Program

The University will admit a limited number of highly qualified freshmen to the Bachelor of Arts or Bachelor of Science Degree/Juris Doctor (J.D.) degree program. Freshman students accepted to this program have to complete their undergraduate program, graduate in the top 15% of their class, and score in the top 20% on the Law School Aptitude Test (LSAT) before they can begin the Law School studies. Students who are accepted as freshmen to this program and meet the above criteria will be eligible to continue their studies in Northeastern University's School of Law.

For more information about this program, please contact the Dean of Admissions.

Community Financial-Aid Grant Programs

To supplement student earnings from cooperative education experiences, and the University's regular student financial aid program, the University has established a number of special community grant programs for disadvantaged students. In all cases, students have to be accepted for admission and complete the University's application procedure for financial aid (see page 274 for complete details) to qualify for one of the special community grant programs. For additional information, write to the Department of Undergraduate Admissions.

Five-Year Bachelor's/Master's Degree Cooperative Education Program

Qualified high school students committed to reaching a high level of success in engineering can now accelerate their progress by entering directly into the College of Engineering's Five-Year Bachelor's/Master's Degree Program. This full-time program allows honor students to earn both degrees in five years—and at the same time gain extensive on-the-job experience.

The BS/MS program is offered by three departments: Electrical and Computer Engineering, Industrial Engineering and Information Systems, and Mechanical Engineering. The program incorporates cooperative education, enabling students to alternate periods of academic work with paid employment in their chosen career field.

Students generally take five courses per quarter and must maintain a 3.2 quality point average to continue in the program. All students begin with a basic curriculum that includes calculus, physics and labs, computer programming, and chemistry. At the same time, study of the social sciences and humanities broadens their awareness and understanding of the spheres in which they will practice their professions.

For additional information, students should contact the Department of Undergraduate Admissions.

College of Arts and Sciences

Students accepted for entrance to the College of Arts and Sciences should refer to page 17 for the description of the four tracks students are placed in by the College before beginning their freshman studies.

Alternative Freshman-Year Program

The Alternative Freshman-Year Program was developed in collaboration with University College, a division of Northeastern serving students who seek a flexible course schedule. This degree-track program may be ideal for those students who feel that their high school grades and/or test scores do not reflect their true abilities.

This program is specifically structured to assist students in making the academic and social adjustments necessary for success in college. Working with a counselor, students follow a prescribed curriculum designed to meet their individual needs and to help them sharpen basic academic skills in writing, mathematics, and reading comprehension, while gaining confidence in their ability to do college-level work. In addition, the program also permits students to sample different areas of study before committing themselves to a specific major.

The full range of counseling services, physical education facilities, dormitory arrangements, and extracurricular programs is generally available to students enrolled in this program.

For further information about the Alternative Freshman-Year Program, see page 226.

Programs for Minority Students

Northeastern University is committed to expanding educational opportunities for minority students of high academic promise and to enrolling a student body reflective of the diverse ethnic and social composition of our society.

To ensure that minority students have the greatest opportunity for success, the University's African-American Institute provides tutorial, counseling, and academic services.

Dr. Ralph J. Bunche Scholars Program

Northeastern University honors the late Dr. Ralph J. Bunche, Nobel Peace Prize laureate and former undersecretary of the United Nations, by awarding ten Ralph J. Bunche Scholarships annually to black students who have compiled outstanding records of academic achievement and leadership. The Bunche awards are full-tuition scholarships in the freshman year and half-tuition grants in the remaining years of study at Northeastern, provided that the student maintains a superior scholastic average. For more information and application materials write to: Chairperson, Dr. Ralph J. Bunche Scholars Committee, African-American Institute, Northeastern University, 360 Huntington Avenue, Boston, MA 02115.

Project Ujima

Project Ujima is an intensive academic support program for students whose earlier education did not prepare them adequately for the college program of their choice.

It provides Project Ujima participants with a variety of supportive services aimed at developing academic skills and a positive attitude toward learning throughout their tenure at the University. Special counseling, tutorials, and educational workshops comprise supportive activities of the Project. Project Ujima is an academic component of the African-American Institute.

Open Campus Courses

Under Northeastern University's Open Campus Plan, qualified high school students who can gain release from their schools are invited to take full-credit courses at Northeastern while they are still enrolled in secondary school. In this way, students are able to gain a better idea of the collegiate environment while they work toward college credit. For further information, write to the Department of Undergraduate Admissions.

Orientation and Registration

The orientation and registration program officially launches your academic career at Northeastern.

The administration, faculty, and many upper-division students have planned several days of programs, faculty seminars, meetings, and special events designed to help you adapt to college life in general and Northeastern University in particular.

In addition to participating in regular registration operations, receiving class schedules, and purchasing books, you will meet with the dean and faculty members of your college, who will provide information concerning your planned academic major, courses, and career goals.

You will have the opportunity to attend "how to" seminars, i.e., study successfully, be assertive, make friends, etc., as well as peer-counseling sessions, and many other informative events. The

Department of Cooperative Education, for example, has planned meetings regarding job opportunities and school-work experiences.

You will be introduced to members of more than 150 student organizations, some of which you might choose to join. Guided tours of Boston's historical and cultural centers will also be available.

Skill and Competency Development

Responding to a growing national concern for the improvement of basic writing, numerical, and reading/study skills, the University extends to freshmen in several of its participating Colleges the opportunity to enhance the likelihood of academic success as freshmen through enrollment in compensatory (i.e., development) courses.

Selection for such course work is based upon the correlation of competency data, derived from specifically prepared testing procedures administered on campus along with pre-freshman academic credentials.

The freshman writing sequence, the mathematics sequence, and the reading/study skills course each bears full credit in participating Colleges. (See page 224.)

Instructors, freshman advisers, and the Freshman Affairs Staff of the Dean of Students' Office are ready to assist involved freshmen in achieving success in their endeavors.

Special Students

A limited number of special students may be admitted to the Basic Colleges. Special students are not degree candidates and must meet criteria set by the college to which they are admitted.

Those admitted as special students usually have completed some college-level work. The following are among the applicants who may be considered:

- a college or university graduate who needs additional course work to prepare or qualify for a graduate program;
- individuals, recommended by deans or program directors, who need particular formal course work to meet professional requirements for certification;
- students who need several courses to complete degree requirements at another college or university, provided they have written approval from the appropriate college dean; others who are recommended by deans of the colleges to take courses leading to regular admission. In such cases, special-student enrollment should be limited to one academic quarter.

All special students will be charged a nonrefundable application fee of \$25. Before obtaining and paying for an application, the potential special student should consult a counselor in the office of the dean of the college offering the course(s) desired. Tuition will be at the quarter-hour rate in effect at the time and must be paid before registration is valid. Special students will be admitted to classes only when there is space available.

All special students must obtain approval from the office of the dean of the Basic College in which they wish to enroll prior to each quarter's registration, but will be required to pay the application fee only once.

International Students

International students are required to complete and file the regular undergraduate application *at least six months before registration*. They must meet all admission requirements, including the standardized tests administered by the College Board. All academic credentials should be translated into English before being forwarded to the Department of Admissions. After notification of acceptance, students must pay the required deposits and fully complete the University's Declaration and Certification of Finances Form by the date specified on the acceptance certificate before a Certificate of Eligibility (I-20 Form or IAP-66 Form) can be forwarded.

All international students participate in the University's five-year Cooperative Plan of Education. Only students in the College of Arts and Sciences may petition to complete their degree program in four years.

Northeastern University is authorized under Federal law to enroll nonimmigrant alien students.

Students may obtain a copy of the international student admissions booklet, *Many Tongues, One Language*, by writing to the Department of Undergraduate Admissions.

Ambassador Awards for International Students

The University offers ten half-tuition scholarships to non-U.S. citizens for the freshman year (three academic quarters—September through June). The scholarships are awarded to individuals whose application for admission and secondary school credentials give proof of exceptional academic achievement. The Ambassador Awards are given to freshmen enrolled in a full-time academic program and are not renewable.

English as a Second Language Proficiency Requirement

Before being considered for admission, students whose native language is not English are required to demonstrate some English language proficiency. This can be done by submitting the results of the College Board's Test of English as a Foreign Language (TOEFL), by successfully completing an approved English language course of study, or by being currently enrolled in such a course.

Before being allowed to enroll in any university classes, all international students, along with any other student whose first language is not English, are required to take the English Proficiency Test administered by the University's English Language Center. This requirement applies to all nonnative speakers regardless of the length of time they have been in the United States or their previous study of English.

The results of this test will be used to assign students to their English courses. Students with minimal English language skills will be assigned to the noncredit Intensive English Course. The level of course work required in English will determine the student's academic schedule.

Admission of Transfer Students

Students wishing to transfer to Northeastern University may request advanced standing credit as upperclassmen on the basis of acceptable credits earned in an accredited two- or four-year institution or a technical institute. In addition, Northeastern University participates in the Advanced Placement Program (APP) as administered by the College Entrance Examination Board. The University will grant college credit for such courses in which a score of 3 or better has been attained. Students may also receive advanced standing credit for satisfactory performance through both the General and Subject Examinations of the College Level Examination Program (CLEP). A score of 500 or better (general examinations) and a score of 50 or better (subject examinations) are required on any CLEP test to receive credit at Northeastern University.

Basic Requirements

1. Transfer students will be admitted to Northeastern University when they have achieved a satisfactory college record at another institution; that is, a satisfactory record appropriate to the course of study they wish to pursue.
2. Credit will generally be granted toward a Northeastern degree for any reasonably equivalent course completed with a passing grade at another accredited institution.
3. Candidates must be in good standing and must be eligible to continue in the institution they are currently attending.

Application Procedure

1. Complete an application for admission form and forward it with a non-refundable fee of \$25.00 to the Department of Undergraduate Admissions. All transfer students are required to indicate their choice of college and major on the application.
2. Submit an official transcript of their high school record.
3. Request that an official transcript from each college attended be sent to the Office of Undergraduate Admissions directly from the Registrar's Office of the respective colleges. A listing of courses in progress for the current academic year (including course number, course title, and number of credits to be earned in each course) should also be forwarded.

Note: Transfer students are not required to complete entrance examinations.

Deadline dates for completion of all applications for each of the four quarters are as follows:

Winter Quarter	November 1
Spring Quarter	February 1
Summer Quarter	May 1
Fall Quarter	July 1

The Test of English as a Foreign Language (TOEFL) is required for transfer students whose native language is not English. International students must obtain authorization from the Immigration and Naturalization Service to transfer from one school to another. Please refer to page 255 for complete information for International Students.

Orientation and Registration

All transfer students are required to participate in an orientation and registration program scheduled immediately before the beginning of classes. This one- to five-day program provides transfer students with the opportunity to meet with their faculty advisers and plan their course schedules. They will also meet with members of the Student Affairs Office and the Cooperative Education Department.

Students should bring a copy of their official Certificate of Acceptance to the Orientation and Registration program. In most cases, the certificate will list each course (and its credit value) for which the transfer student has received credit. The total number of credits being received will also be listed on the certificate.

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Students will only receive full transfer credit for courses that are listed on the certificate of acceptance and for which a grade has been recorded on an official transcript from their former college(s).

Transfer credit from other institutions is not computed into the Northeastern University quality point average.

Northeastern University uses the quarter calendar and awards quarter hours of credit for courses that are successfully completed. Each quarter hour of credit is equivalent to three quarters (3/4) of one semester hour. Most Northeastern courses are equivalent to three (3) semester hours of credit or four (4) quarter hours.

In general, students who successfully complete 48 quarter hours will usually qualify for sophomore standing, 80 for middler, 112 for junior, and 148 for senior. All upperclass course selection for transfer students is planned with their faculty advisers.

Additional information about transfer policies and procedures may be obtained from the Department of Undergraduate Admissions.

Required Deposits from Freshmen and Transfer Students

If the Committee on Admissions makes a favorable decision on a student's application, the student will be asked to submit a nonrefundable tuition deposit of \$100 by May 1. This deposit serves as an indication of intent to enroll and is applied to the first-quarter tuition account.

Students applying for entrance dates other than September should carefully read their certificates of acceptance, which will indicate the required deposit dates.

Students interested in housing must submit a nonrefundable \$400 deposit. For further information and instructions refer to the Housing section page 268.

General and Special Health Requirements

Prior to registration at Northeastern the Lane Health Center's Pre-entrance Physical Examination Form is sent to each student following acceptance. It is mandatory that each accepted applicant return this completed form, which includes the medical history. This examination *requires* a tuberculin test within six months of the registration date. A rubella titre test is also *required* for all students. All students are required by Massachusetts law to have physician-documented proof of having been immunized against measles, mumps, rubella, tetanus, and diphtheria. This information must be forwarded to the University physician for review. Proper health clearance is considered a condition of admission.

Except in the most extreme instances, neither physical nor emotional problems are considered a bar to admission. In fact, we actively encourage handicapped students to become part of the University community. With pertinent information, we usually can make the adjustments to college life smoother and supply special aids when needed.

Sound health and physical fitness are especially important for students in the Boston-Bouvé College of Human Development Professions and the College of Nursing and are required by their nonuniversity affiliations. Candidates for admission to the College of Nursing are required to receive special health clearance prior to enrollment. A repeat health examination by the Lane Health Center is given in the third year for physical therapy students in the Boston-Bouvé College of Human Development Professions.

Students in Medical Laboratory Science, Radiology, Pharmacy, Nursing, and Physical Therapy are required to have a recent tuberculin test prior to entering clinical affiliations.

A tuberculin test is also required of all students prior to entering their period of student teaching.



College Expenses

Students are advised that tuition rates, room-and-board charges, and fees are subject to revision by the Board of Trustees at any time. All registered Basic College students are considered full time and are charged full tuition for course work of 12 quarter hours or more. In addition, charges will be made for course work beyond the normal academic schedule.

Students should note that the freshman year consists of three quarters of full-time study. The Cooperative Plan, whereby students may be gainfully employed, does not begin until the sophomore year.

The primary purpose of the Cooperative Plan is to provide invaluable on-the-job training, but it also can help make education possible without the accumulation of a large personal debt. Because of the Plan—and the University's determination to keep basic expenses as low as possible—many deserving students who might not otherwise be able to afford an education have attended Northeastern.

Expenses for the Freshman Year (Three Quarters)

Tuition for the freshman year, for those who enroll in September, is payable in three installments at the beginning of the fall, winter, and spring quarters. For those who enroll in January, payments are due at the beginning of the winter, spring, and summer quarters.

Board-and-room expenses for those living in University-sponsored residence facilities vary slightly according to the dormitory to which a student may be assigned. These costs are computed on the basis of a seven-day-a-week arrangement and are also paid in three installments at the beginning of each quarter.

Total Freshman Expenses	Application Fee	\$ 25.00
	Tuition (Engineering, School of Engineering Technology, Business Administration, Computer Science)	7,575.00†
	Tuition, Boston-Bouvé Physical Therapy	7,275.00†
	Tuition (all other colleges)	6,930.00†
	Board (based on the 21-meal plan)	2,325.00†
	Room*	2,580.00†
	Student Center Fee	37.50†
	Student Activities Fee	25.50†
	Infirmary Fee (if applicable)	75.00†
	Health Services Fee	320.00
	Laboratory Deposit (if applicable; \$20.00 charge for extra cards)	40.00

The above list excludes personal expenses and expenses for books and supplies.

* This scale is for Speare and Stetson Halls. Rates for other residence halls may vary. Students occupying single rooms will be charged an additional \$25 per quarter. See Housing section, page 270.
† Payable in three installments at the beginning of each freshman quarter: September 29, 1986; January 5, 1987; and April 6, 1987. For students who enroll in January, the dates would be January 5, 1987; April 6, 1987; and June 29, 1987.

Special Note

A nonrefundable deposit of \$100 for tuition is payable not later than May 1. An additional nonrefundable deposit of \$400 will be required from those who request housing. These deposits are applied to the first-quarter costs. (See also page 267.)

Expenses for Upperclassmen (per Academic Quarter)

	Tuition for Arts and Sciences, Boston-Bouvé,* Criminal Justice, Nursing, Pharmacy and Allied Health Professions	Tuition for Engineering, School of Engineering Technology, Computer Science, and Business Administration
Division A		
January 5, 1987	\$3,200.00	\$3,550.00
June 29, 1987	3,200.00	3,550.00
Division B		
September 29, 1986	3,200.00	3,550.00
April 6, 1987	3,200.00	3,550.00
Division C**		
September 29, 1986	3,200.00	3,550.00
January 5, 1987	3,200.00	3,550.00
April 6, 1987	3,200.00	3,550.00

* Physical Therapy Program = \$3,325.00 per academic quarter.
** Division C is the term used to denote the classification of students who are temporarily or permanently on a noncooperative academic year. Certain students in the College of Arts and Sciences may select a noncooperative four-year program. In other colleges, this program is temporary, sometimes required of transfer students to phase into the Cooperative Plan.

Required Fees for All Students

Application Fee	A fee of \$25 is required when the application for admission is filed. This fee is nonrefundable.
Accident and Sickness Insurance	The University provides an excellent hospital insurance and student health program. All students will pay a nonrefundable University Health Service fee of \$320 per year. This fee will cover the group Blue Cross–Blue Shield program and the medical services provided to students by the University Health Service.
Student Center Fee	All students in the Basic Colleges on the Huntington Avenue campus are charged a fee of \$12.50 per quarter for the services available in the Student Center building.
Graduation Fee	The University requires a \$40 graduation fee from all candidates for a degree. This fee must be paid before the end of the fifth week of the last scholastic quarter in the senior year. Candidates in the College of Nursing are also required to pay a charge of about \$10 for their graduation pins.
College of Nursing Uniforms	Students in the baccalaureate degree program of the College of Nursing purchase uniforms in the fall quarter of the sophomore year.
College of Pharmacy and Allied Health Professions Uniforms	<p>Students in Respiratory Therapy purchase uniforms in the spring quarter of the sophomore year.</p> <p>Students in Dental Hygiene purchase uniforms in the fall quarter of the freshman year.</p> <p>Students in Radiologic Technology purchase uniforms in the fall quarter of the freshman year.</p> <p>Students in the Medical Laboratory Science programs purchase laboratory coats in the spring quarter of the freshman year. Co-op assignments to hospitals usually will require uniform purchases in the spring or summer quarter of the sophomore year.</p>
Student Activities Fee	A fee of \$8.50 per quarter for all students to fund student clubs, activities, etc.

Photo-Identification Operation	<p>All full-time students, staff, and faculty are required to have an officially approved and properly validated photo-identification card. All students are required to show their I.D. card at the Library, athletic events, student elections, Health Services, and the Bursar's or Registrar's Office.</p> <p>An official I.D. card will be issued to new students at their orientation and registration periods. Replacements for lost cards can be obtained by going FIRST to the Cashier's Office, 248 RI, and then, for the photo, to 251 Ell Student Center between the hours of 11:30 a.m.–2:30 p.m., Monday through Friday. A charge of \$2 is levied for the initial I.D. card; \$5 for a replacement.</p>
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Other Fees

International Student Fee	There is a one-time fee of \$200 charged to new, undergraduate international students, payable upon their acceptance at Northeastern.															
Liability Insurance	Freshmen majoring in the Colleges of Nursing (Bachelor Degree Program and Special Program for R.N.s) and Allied Health (Respiratory Therapy), as well as all upperclass students in Nursing, Pharmacy and Allied Health Professions (excluding Health Records), and medical or health-related programs in Boston-Bouvé College of Human Development Professions, are required to carry liability insurance. A fee of \$18 is charged per year.															
Deferred Payment	<p>Deferred payment of tuition entails a fee of \$10, which is levied on all accounts not paid by the end of the second week of classes. To arrange for the deferred payment plan, students must contact the Bursar's Office before the start of the second week of classes.</p> <p>The following is the only deferred payment plan available:</p> <table><tr><th colspan="2">Portion of Bill for</th><th>Due</th></tr><tr><th colspan="2">Current Quarter</th><td></td></tr><tr><td>First Payment</td><td>1/3</td><td>First week of Quarter</td></tr><tr><td>Second Payment</td><td>1/3</td><td>Fourth week of Quarter (approx.)</td></tr><tr><td>Third Payment</td><td>1/3</td><td>Eighth week of Quarter (approx.)</td></tr></table>	Portion of Bill for		Due	Current Quarter			First Payment	1/3	First week of Quarter	Second Payment	1/3	Fourth week of Quarter (approx.)	Third Payment	1/3	Eighth week of Quarter (approx.)
Portion of Bill for		Due														
Current Quarter																
First Payment	1/3	First week of Quarter														
Second Payment	1/3	Fourth week of Quarter (approx.)														
Third Payment	1/3	Eighth week of Quarter (approx.)														

Late Payment Fee	A fee of \$100 will be assessed for failure to arrange for, and make, payments in accordance with the prescribed regulations.
Laboratory Deposits	Students taking laboratory courses should be prepared to purchase laboratory deposit cards from the Cashier as directed by the department offering the course. These deposits will be charged with deductions for breakage and destruction of apparatus in the laboratory. A charge of \$20 each is made for extra cards.
Reserve Officers' Training Corps Uniform Deposit	Freshmen enrolling in ROTC make a deposit of \$35 to cover loss of, or damage to, ROTC uniforms and equipment. Any loss or damage exceeding the deposit will be charged to the student.
General	Students in the College of Nursing may expect to be assessed fees for clinical laboratory experiences. Physical Education majors pay a room-and-board charge for a resident program at the Warren Center in the spring quarter. Recreation and Leisure Studies students pay a fee for a one-week term of camping at the Warren Center. A one-week session in winter sports is optional for Recreation and Leisure Studies majors in their junior or senior year (at a cost of \$175).
Overloads	Tuition covers the cost of each student's required courses for a quarter. In addition, a course worth one quarter hour of credit may be taken without added charge. However, any other additional courses will be billed as overloads.
Payment of Tuition	<p>All payments should be made by mail or at the Cashier's Office, 248 Richards Hall. Checks should be made payable to Northeastern University. Beginning with the second week of any quarter, students are not eligible to attend classes unless their tuition has been paid or specific arrangements have been made with the Bursar for a plan of deferred payment.</p> <p>It is the student's responsibility to ensure that all tuition and dormitory charges and fees are paid when due. If a bill has not been received prior to the start of classes each quarter, the student must come to the Bursar's Office where a bill will be processed. If there is a billing problem, the undisputed portion of the bill should be paid on time to avoid any additional late fees. Failure to receive a bill through the mail or to pay the undisputed portion of the bill is not justification for late payment of amounts actually owed.</p>

Refunds

The University provides all instruction on an academic-quarter basis, for which students pay at the beginning of each quarter. Tuition refunds in all schools and colleges may be granted through the first four weeks of a quarter only when specific conditions are met and on the basis of the date appearing on the official withdrawal application. (Nonattendance does not constitute official withdrawal.) Questions regarding refunds should be discussed with the Dean of Students' Office. When approved, refunds are made as follows:

Tuition Refund	Official Withdrawal Filed Within	Percentage of Tuition Refunded
	1st week of Quarter	100%
	2nd week of Quarter	75%
	3rd week of Quarter	50%
	4th week of Quarter	25%

Room and Board	Rental charges for rooms in University accommodations are refundable only in cases of withdrawal prior to the start of a quarter (except in special circumstances so adjudged by the University). The deposit is not refundable. Board charges may be refunded for all unused portions when the food identification card is surrendered to the Office of Food Services.
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Northeastern University's location, in one of the most central and exciting sections of Boston, offers the student an opportunity to participate in many cultural and educational activities. With residence halls on the Back Bay campus, between the Museum of Fine Arts and Symphony Hall, the city is at your doorstep. Northeastern's library, student center, and athletic facilities are nearby.

Most of the residence halls have lounge areas and recreation rooms, including color television. Privacy and a quiet study environment are encouraged, but students must recognize that residence hall living cannot provide the privacy and quiet they may enjoy in their own homes. However, the benefits, as well as the occasional inconveniences of living in a community, may contribute to personal growth.

A natural advantage of residence living may be the increased involvement in social and educational activities. Students are encouraged to join the committees that make decisions about student life.

Full- or part-time residence hall staff reside in each residence facility.

Housing Applications and Contracts

Housing applications and contracts are administered by the Office of Student Housing. All new students who have been accepted by the University and who have requested housing on their application for admission will receive a housing application and deposit card from the Office of Student Housing after payment of the \$100 tuition deposit.

To complete the housing application process, freshmen and transfer students must return the housing application to the Office of Student Housing, and the deposit card with a \$400 room deposit to the Office of the Bursar.

The housing contract for freshmen is for three full quarters of the freshman year. The contract for transfer students is for one quarter at a time.

Returning upperclass students must apply for housing each quarter. The upperclass housing deposit is \$250.

All students are assigned on a first-come, first-served basis. The nonrefundable housing deposits are credited toward the first quarter residence charges.

Married Student Housing

No University housing is available for married students. However, the University does maintain listings of off-campus rooms and apartments. These are available at the Office of Student Housing, 104 Ell Building. Although the Housing Office has agreed to make this listing available, we do not inspect or endorse the advertised property or space.

The Selection

The choice of housing is an important consideration for the first year, and freshmen are encouraged to visit Northeastern before making a decision. Tours of residence halls are available by advance arrangement with the Department of Admissions.

Most rooms are designed to accommodate two students, however three- and four-person rooms are available in some facilities. Some residence halls feature "group areas" that house three or more students in a multi-room suite.

The University maintains some apartment units for men and women. These apartments accommodate up to four students. Assignments are made based on the date of receipt of the housing deposit and application. Each unit is fully furnished, and the rental charge includes utilities.

Off-Campus Housing

Arrangements for off-campus housing are the responsibility of the student and the student's family.

Fraternity Housing

Certain fraternities provide opportunities for room and board for men at reasonable rates. Information regarding these housing facilities may be obtained from the Office of Student Housing 104 Ell Building, Northeastern University, Boston, Massachusetts 02115.

Cars

Freshmen living in residence halls are not allowed to have cars or other powered vehicles on campus.

Upperclass students are strongly discouraged from bringing cars with them, as the University does not permit overnight parking, and there is a severe shortage of public parking spaces near the University.

Costs for Room Per Quarter*	Women's Residence Hall	
	Kerr Hall	\$725
	Coed Residence Halls	
	Smith Hall (upperclass students only)	\$725
	Speare Hall	\$860
	Stetson Hall West	\$860
	Stetson Hall East	\$860
	White Hall	\$860
	YMCA (Huntington Avenue)	\$755
	115 Hemenway Street	\$860
	119 Hemenway Street	\$860
	157-163 Hemenway Street	\$860
	400 The Fenway (Emmanuel College)	\$725
	Men's Residence Halls	
	Melvin Hall	\$725
	Light Hall	\$725
	153 Hemenway Street	\$860
	Apartments	
	106-122 St. Stephen Street	\$940
	Fairwood Apartments—319 and 337 Huntington Avenue	\$860
	Museum Villa—454, 458, 460 Huntington Avenue (men only)	\$940
	407 Huntington Avenue	\$860
	Rubenstein Hall—464 Huntington Avenue	\$940
	West Apartments—50 Leon Street	\$1,010

With the exception of the YMCA, all single rooms are charged at an additional rate of \$25 per quarter. An infirmary fee of \$25 dollars per quarter is charged to resident students.

*Costs and types of residence halls (coed, apartment, women) are subject to change.

University Food Service

All students who live in University residence halls are required to participate in the University food plan. Three different meal plans are available. During the first quarter, all entering freshmen must participate in the twenty-one-meal-per-week plan. They have the option to select another plan at the start of the second quarter of the academic year.

Meals per Week	Cost per Quarter
21	\$775
15	\$700
10	\$635

Students living in University apartments are not required to be on the food plan; however, they may choose one of the meal plans if they wish. When conditions warrant, such as during weekends and slow periods, the University may close or consolidate certain dining facilities.

Security

Security for the residence facilities is provided by trained University police officers. In addition, residents are required to show appropriate identification to the security proctor when entering the residence hall. Guests, both male and female, must sign in with the proctor.

The University police provide escort service for students who wish to go from one section of the campus to another late at night.



Financial Assistance

Charles M. Devlin, M.Ed., *Dean of Student Financial Services*

The Office of Financial Aid provides a full range of financial services to assist students in paying for their educational costs. In addition to determining eligibility for traditional federal, state, and institutional financial aid programs, the office provides information and services on alternate sources of financial assistance.

The office maintains a full library of resource materials on scholarships, grants, fellowships, prizes, and awards offered by outside agencies and organizations. These reference books, catalogues, and pamphlets are available for review to all Northeastern students during regular office hours.

The Office of Financial Aid also provides a part-time job referral service for all Northeastern students. Part-time job opportunities are posted on bulletin boards outside room 253, Richards Hall. Most part-time job opportunities are off-campus. The part-time employment office also provides assistance in preparing résumés, tips on job interviews, and other information that is useful in obtaining part-time employment.

Financial aid funds that are awarded based on family income and financial need are administered in accordance with nationally recognized and accepted principles. A fundamental premise of Northeastern's need-based financial aid program is that parents have an obligation to pay for the education of their children to the extent that they are financially able. In addition, students are expected to contribute to their educational cost from summer and co-op earnings, outside agency awards, their own assets, and other resources they may have. Financial aid is awarded only for meeting the difference between the total family contribution (from parent and student) and the annual educational costs.

Financial aid must be applied for annually, as outlined below. Criteria established by the College Scholarship Service and approved by the U.S. Department of Education are used in making evaluation of eligibility. This evaluation includes an objective analysis of the family's financial circumstances including: income, household size, number of family members in college, assets, and indebtedness.

In order to receive financial assistance, a student must be a U.S. citizen or an eligible permanent resident of the United States.

Eligibility and Selection

In order to be eligible to participate in the financial aid program at Northeastern University, all students must: a) be in attendance at Northeastern University; b) have documented financial need; c) apply for financial aid, completing the proper application forms and submitting them in a timely fashion; d) be enrolled in an eligible degree or certificate program on at least a half-time basis;

and making normal academic progress as determined by the college in which the student is enrolled; and e) meet any other eligibility requirements of the individual aid programs.

Due to limited funding, Northeastern University is not always able to meet the full financial need of all applicants. Priorities in awarding aid will be based on highest financial need, meeting application deadlines, and the potential for academic achievement. All financial aid is contingent on the availability of funds.

Most students who attend Northeastern University move along with their class. On request, information about retention and attrition can be obtained from the Office of the Dean of Students.

Mail inquiries to

Northeastern University
Office of Financial Aid
P.O. Box 75
Boston, Massachusetts 02117

Office Hours

8:30 a.m. to 4:30 p.m., Monday–Friday, *except* 8:00 a.m. to 5:30 p.m. Monday–Thursday during July and August

Telephone Numbers

General Information (Financial Aid)	254 RI	617-437-3190
Pell Grant Information	275 RI	617-437-3804
Help/GSL/Parent Loans	256 RI	617-437-3386
Initial-year Information	253 RI	617-437-3907
Student Employment Center	253 RI	617-437-3200

Application Procedure: Undergraduate Programs

Initial Year (Freshman and Transfer Students)

Applicants seeking financial assistance are required to complete and mail a Financial Aid Form (FAF) to the College Scholarship Service by February 15 for Summer or Fall entrance and by October 15 for Winter or Spring entrance. Transfer applicants must also have completed Financial Aid Transcripts from all previously attended post-secondary schools. Financial Aid Transcripts must be received by April 15 for Summer or Fall entrance and by October 15 for Winter or Spring entrance.

On the FAF you must indicate Northeastern University (code 3667), the Pell Grant Program, and your state scholarship program (if applicable) as recipients of the FAF. The FAF is available from secondary school guidance offices or the Financial Aid Office.

Awards are made on a first-applied, first-aided basis and are contingent on continued funding. The typical award takes the form of a package combining a grant, a loan, and/or part-time employment. Awards may be adjusted at any time upon receipt of other funds or changes in status.

Upperclass (Sophomore-Senior)

Upperclass applicants are required to submit a Financial Aid Form to the College Scholarship Service and a Northeastern University "Upperclass Application for Financial Assistance" each year for which they desire assistance. On the FAF you must indicate Northeastern University (code 3667), the Pell Grant Program, and your state scholarship program (if applicable) as recipients of the FAF. The FAF must be filed by February 15 for all upperclass aid applicants. The "Upperclass Application" is due by April 15 for students in school Fall and Spring quarters and August 15 for students in school Winter and Summer quarters. Financial aid awards are made for the entire academic year.

State Assistance Programs

The Office of Financial Aid strongly advises applicants for aid to apply to state scholarship programs at the same time that they apply for aid from the University.

State Grants and Scholarships	<p>The Commonwealth of Massachusetts provides scholarship aid to Massachusetts students pursuing full-time programs of study in an accredited college or university. Application is made by completing the Massachusetts version of the Financial Aid Form by the published deadline. Awards are made in the summer of each year, and applications for entering freshmen are available through their high school guidance offices. Out-of-state students should investigate aid programs in their respective states. The following states allow students to use their state grants at Northeastern: Connecticut, District of Columbia, Maine, Maryland, New Hampshire, Pennsylvania, Rhode Island, and Vermont.</p> <p>The Commonwealth of Massachusetts also provides assistance through the Gilbert Matching Grant Program and three pilot programs which include a work and two grant programs. Application for these programs is based on a completed Financial Aid Form. Funds are awarded by the Financial Aid Office based on guidelines published by the state.</p>
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Massachusetts Family Education Loans	<p>The Massachusetts Education Loan Authority, in cooperation with Northeastern University, offers a program of Family Education Loans under which parents can borrow to pay the cost of education and repay in low monthly payments over fifteen years. Neither students nor parents need to be Massachusetts residents. A credit-worthy spouse may also qualify to borrow under the program. To participate, a student must be enrolled at least half-time. Families can borrow up to three-quarters of the yearly cost of attendance. There is a \$2,000 minimum loan amount. Applications may be requested from the Office of Financial Aid.</p>
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Federal Programs

Note: All Federal financial aid programs are subject to change, depending upon adequate and continuing Federal support.

Pell Grant

This is a program of direct federal grants to undergraduate students only. Eligible students can receive as much as \$2,100 per year toward the cost of their education. Pell Grants are generally available to all students who have not previously received a bachelor's degree, who are not in this country on a student visa, and who are attending college on at least a half-time basis (minimum 6 quarter hours). Students must be enrolled in an eligible program for the purpose of obtaining a degree or certificate. To utilize this program to the fullest, all students applying for financial aid *must* file for a Pell Grant.

Applications for a Pell Grant can be made on the Financial Aid Form (FAF), which is available from local high schools, or by calling the Pell Grant unit of the Financial Aid Office at 617-437-3804.

College Work-Study Program

This is a need-based program of part-time employment under the sponsorship of the federal government. It is designed to help full-time students meet their educational expenses. Students generally work part-time while attending classes. Eligible students may work for the University or for public or private nonprofit off-campus agencies. The Office of Financial Aid has the responsibility of placing qualified students in their job assignments.

Supplementary Educational Opportunity Grant

Supplementary Grants are direct awards provided by the federal government. They are available to a limited number of full-time undergraduate students who present evidence of needing financial assistance. Eligible students who are accepted for entrance may receive Supplementary Educational Opportunity Grants ranging from \$200 to \$2,000 for each year of their undergraduate education.

Health Professions Loan

This program is available to full-time undergraduate students who have been accepted for a course of study leading to a Bachelor of Science degree in Pharmacy. A student who evidences financial need and academic promise may borrow as much as \$2,500 per academic year. Repayment of principal and interest does not begin until one year after the student ceases to pursue a full-time course of study. Repayment of principal may be extended over a ten-year period with interest at the rate of 9 percent per annum.

Guaranteed Student Loan Program

Under this program, students who are enrolled for at least one-half the normal academic work load may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but the law allows dependent undergraduates to borrow a maximum of \$2,500 per year, up to a total of \$12,500, for undergraduate study. The federal government pays the interest while the student is in school. The student must begin repaying the principal of the loan plus interest shortly after the student drops below half-time enrollment.

Applications for the loan itself are available from local banks or the education office of your state government. Additional information and necessary application forms for first-time borrowers are available from the Financial Aid Office.

Parent Loans for Undergraduate Students

Under the Parent Loan Program (PLUS), parents of dependent undergraduate students may borrow up to \$3,000 per year for each child enrolled in an approved educational institution. These loans are also offered by banks and

other financial institutions, although terms and availability vary from state to state. Unlike the Guaranteed Student Loans, the PLUS loans require parents to begin repayment of the loan (with 12 percent interest) within 60 days of receiving the loan. Repayment may be stretched out over ten years, as long as the minimum monthly payment of \$30 is maintained. Applications and more information can be obtained from local lending institutions.

National Direct Student Loan

Direct Loans are available to students who present evidence of needing financial assistance. Undergraduate students may borrow up to a maximum of \$3,000 for the first two years, or a total of \$6,000 for their entire undergraduate education. Students are allowed a total maximum of \$12,000 through their undergraduate and graduate education. Repayment of principal and interest on Direct Loans is not required until 6 months after a student graduates or withdraws from the institution. Repayment of principal may be extended over a ten-year period, with the interest rate at 5 percent per annum. Repayment may be deferred up to three years if the student is pursuing at least a half-time course of study or serving in the Peace Corps, VISTA, or the armed forces.

Nursing Student Loan

This program is designed for full-time undergraduate students who have been accepted for a course of study leading to a Bachelor of Science degree in Nursing. Provided financial need is evident, students may borrow as much as \$2,500 each year up to a maximum amount of \$10,000 for their entire undergraduate education. Repayment and interest on these loans do not begin until nine months after the student ceases to pursue a full-time course of study. The repayment of the principal may be extended over a ten-year period with the interest at the rate of 6 percent per annum.

**Reserve Officers' Training Corps
Scholarship Program**

(Refer to section on Reserve Officers' Training Corps.)

University Scholarships

The following scholarships are awarded through the Office of Financial Aid. Because we award specific scholarships to the students who qualify, you should not apply for any specific scholarship. If you feel you are a potential recipient for any of these listed awards, you may bring that fact to our attention.

The Vivian B. Allen Scholarships
Nursing

The Vivian B. Allen Foundation Endowment for nursing scholarships was established in 1968 through the generosity of the Vivian B. Allen Foundation, Inc. The income from a \$500,000 endowment fund is to be used to provide scholarship assistance for students entering or enrolled in the College of Nursing of Northeastern University. The application procedures and qualifications for selection are the same as those for all other scholarships.

Alumni Scholarships
All Colleges

Scholarship aid is available to entering freshmen who are relatives of alumni. Applications must show evidence of scholastic achievement and financial need.

Class of 1967 Alumni Scholarship
Day College Students

The Northeastern University Class of 1967 Alumni Scholarship was established in 1967 and endowed in 1982 by the Class of 1967. Income from the fund is to be awarded each year based on financial need, campus activities, and scholastic achievement. Priority will be given to children, other relatives, and friends of the Class of 1967.

American Optical Foundation Scholarship <i>All Colleges</i>	<p>This annual scholarship was established in 1986 through the generosity of the American Optical Company to benefit entering freshmen students from communities in southern Worcester County. Awards will be made to students who demonstrate ability, soundness of character, and financial need.</p>
Irving Aronson Scholarship <i>Engineering</i>	<p>The Irving Aronson Scholarship for Electrical Engineering students was established through the generosity of the family of Irving Aronson as a living memorial to a man who shared his life with many people and who cared so much for the educational process. Income from this fund will be awarded or loaned to electrical engineering students who demonstrate financial need and academic responsibility.</p>
George L. Barnes Scholarship <i>All Colleges</i>	<p>This fund was established in 1969 by Miriam P. Poole, daughter of George L. Barnes, in memory of her father, a distinguished member of the Northeastern University Corporation and Board of Trustees from 1937 until his death in 1965.</p> <p>The income from this fund will annually provide a full scholarship to a deserving student from Weymouth, Massachusetts. The award is made on the basis of need and character. Some additional assistance may be given in the upperclass years.</p>
The Barry Scholarship <i>Engineering</i>	<p>The Barry Scholarship, established in 1973 by the Barry Division of Barry Wright Corporation, is available to students in the College of Engineering. Preference will be given to mechanical engineering majors and sons and daughters of Barry employees, based upon demonstrable financial need and academic achievement.</p>
The Mr. and Mrs. Emil Matthew Bauer Fund <i>All Colleges</i>	<p>The interest from the fund, established in 1954, is used for scholarships or other financial assistance to students of German birth or of German extraction studying at Northeastern University. The scholarships are available to either men or women students enrolled in any year at the University.</p>
The Alvah K. Borman Memorial Scholarship <i>Gamma Phi Kappa Fraternity Undergraduates</i>	<p>This scholarship was established in 1976 through the generous contributions of Gamma Phi Kappa Fraternity alumni. In 1979, the Gamma Phi Kappa Fraternity Alumni Association, Incorporated, voted to name the scholarship in memory of Alvah K. Borman, Northeastern University's Dean of Graduate Placement. Dean Borman was an active member of the GPK fraternity for over forty-six years, serving as an undergraduate brother (class of 1936), faculty advisor from 1953 to 1965, an active alumnus until his untimely death in 1979.</p> <p>Awards from this fund are made annually to undergraduate members of the Gamma Phi Kappa Fraternity who have demonstrated good academic standing. Recipients of this award must have been members in good standing of the Gamma Phi Kappa Fraternity for at least six months prior to the time of award.</p>
Boston-Bouvé Class of 1935 Scholarship <i>Boston-Bouvé College of Human Development Professions</i>	<p>This fund was established in 1985 by the graduates of Boston-Bouvé College, Class of 1935. The income from the fund is to be awarded annually to a sophomore or junior majoring in Health Education, Physical Education, or Physical Therapy in Boston-Bouvé College of Human Development Professions. The recipient must be a responsible student of sound character with demonstrated leadership ability and a minimum cumulative point average of 3.0.</p>

Boston Housing Authority Scholarships <i>All Colleges</i>	<p>As an expression of Northeastern's commitment to the city of Boston, the University has established 100 full-time undergraduate scholarships for residents of housing developments run by the Boston Housing Authority (BHA). Applicants for the scholarships must meet the requirements for admission to Northeastern and be residents of BHA housing.</p>
Martin Brown Scholarship Fund <i>Engineering</i>	<p>This scholarship was established in 1961 by Mr. Martin Brown, an engineering alumnus of the Class of 1921. Its purpose is to assist qualified students enrolled in the College of Engineering who have need and have demonstrated above-average scholastic ability.</p>
The Richard D. Bruhmuller Accounting Scholarship <i>Accounting</i>	<p>This annual scholarship was established in 1985 through the generosity of Richard D. Bruhmuller and his wife, Elizabeth A. Bruhmuller, an accounting graduate and partner in the public accounting firm of Tobin & Waldstein, who established the fund to benefit students of ability and need who have chosen to pursue a career in public accounting. The income from the fund is to be awarded each year to an upperclass accounting student who displays ability, soundness of character, and financial need.</p>
Wellington Burnham Fund <i>All Colleges</i>	<p>This fund provides financial assistance to worthy students of limited means without discrimination as to race, creed, color, or scholastic attainment. It was established in 1961 under the provisions of the will of George A. Burnham.</p>
The Godfrey L. Cabot Scholarship Fund <i>All Colleges</i>	<p>This fund was established by Dr. Cabot in 1954 to help meet the college expenses of employees or children of employees of Godfrey L. Cabot, Inc., and its subsidiary and associated companies. To be eligible, the employee must have completed at least five years of service with the company prior to the time the student enters the University. The University shall determine the number and amount of these scholarships, which are not limited to outstanding students and which are available to evening as well as day students. Students interested in applying for scholarship aid from this fund should communicate with the Cabot Personnel Office or the Office of Financial Aid at Northeastern University.</p>
Cameron and Colby Ellis H. Carson Scholarship Fund <i>Business Administration</i>	<p>This fund was established in 1983 by Cameron and Colby Company, Inc., in honor of Mr. Carson, former president of its Treaty Reinsurance Activity, known as NERCO. The income from this fund is used to assist a freshman student in the College of Business Administration who demonstrates not only financial need but also academic promise deemed consistent with the high standards of foresight and acumen that characterized the career of Ellis H. Carson.</p>
Camp Dresser & McKee, Inc. Scholarship <i>All Colleges</i>	<p>This scholarship was established in 1973 by Camp Dresser & McKee, Inc., and is available to students in all colleges. Preference for awards will be based upon demonstrable financial need and academic achievement.</p>
Louis S. Cashman Memorial Scholarship Fund <i>Business Administration</i>	<p>This fund was established by the Massachusetts Credit Union Association (CUNA) and friends of Mr. Cashman in recognition of his outstanding service to the credit union movement in the Commonwealth of Massachusetts.</p> <p>This scholarship is awarded annually to students in the College of Business Administration who have need, with particular preference given to those enrolled in banking and finance.</p>

The Gardner A. Caverly Scholarship
All Colleges

This scholarship was established in 1957 through the generosity of Mr. Gardner A. Caverly, an alumnus of the College of Business Administration and a member of the Class of 1934. Its purpose is to provide financial assistance and encourage qualified students from the New England area to attend Northeastern University. In selecting worthy students for these scholarship awards, preference is given to graduates of the Rutland, Vermont, and Laconia, New Hampshire, high schools.

**Carl W. Christiansen
Scholarship**
Business Administration

The Carl W. Christiansen Scholarship Fund was established in 1976 by Mr. Carl W. Christiansen, a graduate of the School of Commerce and Finance, Providence Division of Northeastern University, Class of 1923. Early in his career, Mr. Christiansen was an accounting instructor and associate dean in the Providence Division. In 1927, the accounting firm of Christiansen, Murphy and Company was founded, which in 1940 became known as Christiansen and Company—Certified Public Accountants. The income from this fund is to be awarded annually to an entering freshman in the day College of Business Administration who has demonstrated the necessity for financial aid. Preference will be given to students from the state of Rhode Island who are interested in pursuing a career in accounting.

Ruby H. Cole Scholarship Fund
All Colleges

The Ruby H. Cole Scholarship Fund was established in 1973 under the will of Mrs. Cole, late of Boston, Massachusetts. The income from the fund is awarded annually to one or more female students enrolled in or admitted to undergraduate programs of the Basic College of the University and who are graduates of Roxbury High School, Roxbury, Massachusetts. Recipients must demonstrate financial need, academic stability, and soundness of character.

**Commercial Union Insurance
Companies Scholarship**
Criminal Justice

The income from this fund, established in 1982 by the Commercial Union Insurance Companies, will be used to provide a scholarship to an entering freshman who demonstrates need and shows promise of success in the law enforcement field.

Community Scholarships
All Colleges

The Community Scholarships were established by President Asa S. Knowles during the period 1963–1973. These scholarships stipulate that Northeastern will ensure that full freshman tuition be met in the form of scholarships and grants for qualified students.

In order to qualify for consideration, a student must apply for financial assistance through the normal application procedure and demonstrate need.

The following Massachusetts communities are designated under this scholarship: Boston, Ashland, Burlington, Brookline, Belmont, Brockton, Framingham, Marshfield, Milford, Norwood, Reading, Revere, Sandwich, Westwood, Weston, and Weymouth.

**The Compugraphic Corporation
Scholarship Fund**
All Colleges

The Compugraphic Corporation Scholarship Fund has been established and endowed at the University with a generous gift from an individual. The income from the scholarship fund is to be used annually as financial assistance for persons who are admitted to or enrolled in full-time undergraduate programs of the Basic Colleges of the University and who demonstrate financial need, academic stability, and soundness of character. Scholarships are tuition grants and are awarded to persons who are otherwise eligible and who are, at the time of the grant, children of current employees of Compugraphic Corporation.

**Greater Boston Consumer Credit
Grantor Association Scholarship**
College of Business Administration

In 1985, the Consumer Credit Grantors Association, Inc., established an endowed scholarship fund, the income from which will be awarded annually to students from Massachusetts in their upperclass years majoring in business administration. Selection will be based on financial need, academic promise, and soundness of character. Preference will be given to students who express an interest in the field of consumer credit.

**Arnold L. Cormier
Memorial Scholarship**
Criminal Justice

The Arnold L. Cormier Memorial Scholarship Fund was established in 1980 by Joseph L. and Ruth E. Cormier in memory of their son, Arnold, a student in the College of Criminal Justice, Class of 1981. Arnold was a good student with excellent grades and was an active participant in classroom discussions and college activities.

His untimely death in an automobile accident, while on a weekend trip with two of his classmates, was a tragic loss to his parents and friends. To perpetuate the memory of Arnold Cormier and the spirit of good fellowship for which he stood, this scholarship is awarded annually to a senior in the College of Criminal Justice.

**The Salvatore J. and
Corinne Danca Scholarship**
All Colleges

The Salvatore J. and Corinne Danca Scholarship, established in 1974 by Salvatore J. Danca, a graduate of Northeastern University, Class of 1934, is to be awarded annually to a student enrolled as a sophomore. Selection will be made by the Committee on Scholarships, using academic excellence and financial need as the criteria for selection.

**Elizabeth A. Davey Scholarship
for Physical Therapy**
*Boston-Bouvé College of
Human Development Professions*

The Elizabeth A. Davey Scholarship for Physical Therapy students was established through the generosity of the family and friends at Choate Memorial Hospital on behalf of Elizabeth A. Davey, as a living memorial to a woman who shared her life with so many people. Income from this fund will be awarded or loaned to a physical therapy senior who demonstrates superior academic achievement and financial need.

Charles M. Devlin Scholarship
All Colleges

This fund was established in 1976 by the members of the Class of 1970 "in honor of our dedicated adviser," Charles M. Devlin. The income from the fund will be awarded annually to upperclassmen with proven ability and demonstrable financial need. Preference will be given to children of members of the Class of 1970.

The William O. DiPietro Scholarship
Engineering

This scholarship was established in 1967 through the generosity of Mr. William O. DiPietro, a distinguished alumnus of the College of Engineering and a member of the Class of 1942. The scholarship is awarded to one or more deserving freshmen who demonstrate a high caliber of achievement and a desire to fulfill the limits of their ability in both academic and cooperative periods of study. In considering recipients for this scholarship, preference is given to freshmen enrolled in the College of Engineering who have a desire to major in chemical engineering. It is intended that those students receiving awards from this scholarship might someday contribute to this or other scholarships themselves, thereby perpetuating growing funds that will help other deserving individuals.

**The Diamond Anniversary
Development Program Scholarship**
All Colleges

This scholarship has been established to commemorate the successful conclusion of the Diamond Anniversary Development Program. This scholarship fund recognizes the loyalty and generosity of the thousands of alumni and friends, corporations, foundations, and organizations whose significant contributions of time and resources have brought Northeastern University to "that greatness which is its destiny."

Three \$1,000 scholarships are awarded annually, as follows: to one or more full-time students enrolled in a cooperative education program within a basic college of the University, to one or more part-time students enrolled in a basic college of the University, and to one or more full-time students enrolled in the graduate division or a professional school of the University. Consideration will be based upon financial need, academic stability, and soundness of character.

The Harry Doehla Memorial Scholarship

All Colleges

The Harry Doehla Memorial Scholarship was established in 1974 in memory of Mr. Harry Doehla, founder and president of Doehla Greeting Cards, Inc. During his lifetime Mr. Doehla provided much financial assistance to young people of limited means to help them in furthering their educational goals.

The awards from this fund are available to undergraduate day students, with preference being given to graduates of Fitchburg High School, Fitchburg, Massachusetts, and Nashua High School, Nashua, New Hampshire. Additional consideration will be given to children of employees of Doehla Greeting Cards, Inc.

The Cpl. James B. Downey USMC Scholarship Fund

All Colleges

This scholarship was established in 1970 through the generosity of Mr. William J. Downey, a graduate of the College of Liberal Arts, Class of 1952, in memory of his brother, Cpl. James B. Downey, USMC. The scholarship is to be awarded annually to an upperclassman in the day colleges who has demonstrated the necessity for financial aid.

Agnes F. Driscoll Scholarship Fund

All Colleges

This fund will provide scholarship assistance to students in their upperclass years who have demonstrated financial need and scholastic attainment.

John Elfers Memorial Scholarship

All Colleges

This scholarship was established in 1983 by William and Ann Rice Elfers in memory of Mr. Elfers' brother. The income from the fund is awarded annually to undergraduate students who demonstrate financial need, academic promise, and soundness of character.

Carl Stephens Ell Alumni Scholarships

All Colleges

To honor Dr. Carl Stephens Ell, the second president of Northeastern University, the Alumni Association established these scholarships in 1958. Either freshmen or upperclassmen enrolled at the University are eligible. Awards will be made to worthy students on the basis of scholastic ability and need. The scholarships are to be distributed as equitably as possible among students in the Basic Colleges and University College. Preference shall be given to sons and daughters of Northeastern alumni.

Elmer H. and Daisy M. Everett Memorial Scholarship

All Colleges

This scholarship was established through a bequest of Elmer H. and Daisy M. Everett, both alumni of Northeastern University. Mr. Everett graduated from the College of Engineering, and Mrs. Everett graduated from the School of Business. They are both members of the Class of 1934. Mr. and Mrs. Everett had a strong commitment to help young people wanting to further their education. The fund will be administered by the Office of Financial Aid.

Michael T. Federico Memorial Fund

All Colleges

The Michael T. Federico Memorial Fund was established in 1982 by the Rhode Island Alumni Club, fellow alumni, and friends of Michael T. Federico, a graduate of the class of 1940 and a life-long resident of the State of Rhode Island. Income from the fund is to be awarded annually to one or more students from Rhode Island who are in their sophomore year, have attained a Q.P.A. of 3.0 or better, and have demonstrated financial need.

<p>The George Raymond Fennell Memorial Scholarships <i>Business Administration</i></p>	<p>Two full-tuition scholarships are awarded each year to first-year students enrolled in the College of Business Administration. The scholarships are awarded in memory of George Raymond Fennell, formerly assistant director of admissions and director of the Northeastern Student Union.</p>
<p>Clara and Joseph F. Ford Scholarship Fund <i>All Colleges</i></p>	<p>A fund established by Clara and Joseph F. Ford to provide tuition scholarships for worthy, needy, and well-qualified students who have demonstrated a democratic and tolerant spirit and who are well disposed toward people of all creeds and races.</p>
<p>The Gamma Phi Kappa Fraternity Scholarship <i>All Colleges</i></p>	<p>The Gamma Phi Kappa Fraternity Scholarship was established in 1972 by the Gamma Phi Kappa Fraternity Alumni Association, Incorporated, and was endowed in 1976 through the generous contributions of Gamma Phi Kappa Fraternity alumni and undergraduates. Awards are made annually from interest on the endowment to undergraduate students enrolled in the basic day colleges of Northeastern University who demonstrate good academic standing and financial need. Undergraduate members of the Gamma Phi Kappa Fraternity are ineligible to apply for this award.</p>
<p>The Herbert W. and Geraldine E. Gallagher Athletic Scholarship Fund <i>All Colleges</i></p>	<p>This scholarship was established by Wendy L. Gallagher, a Northeastern University graduate in the Class of 1975, as a tribute and expression of her love for her parents on their golden wedding anniversary.</p> <p>Herbert W. Gallagher, Class of 1935, was an outstanding athlete as an undergraduate and was elected to the Northeastern University Athletic Hall of Fame in 1975. He served the University with dedication for over forty years as a successful coach in hockey and baseball and as its athletic director.</p> <p>This scholarship is to be awarded annually to a deserving male hockey player who demonstrates financial need, academic ability, and the soundness of character that best exemplifies the Northeastern University athlete.</p>
<p>The Nathan Gerber Memorial Scholarship <i>All Colleges</i></p>	<p>The Nathan Gerber Memorial Scholarship was established in 1974 by Albert Gerber, E'52, and Robert Gerber, E'60, in memory of their father, Nathan, a member of the Class of 1925. The scholarship is to be awarded annually to a student or students enrolled in the freshman class with a demonstrable financial need. Selection is made by the Committee on Scholarships.</p>
<p>John and Ethel Goldberg Scholarship Fund <i>All Colleges</i></p>	<p>This fund was established in 1984 through a bequest by Ethel Goldberg. The income from this fund is to be used by the University for the tuition of those students the University deems deserving based upon demonstrable financial need and academic achievement. These awards are available to undergraduate day college students.</p>
<p>The Foster Grant Scholarship <i>All Colleges</i></p>	<p>This scholarship, established in 1974 by the Foster Grant Co., Inc., of Leominster, Massachusetts, is available to students in any of the full-time undergraduate colleges. Preference will be given to children of employees of Foster Grant Co., Inc. Basis for the award will be demonstrable financial need and above-average academic achievement.</p>
<p>Clifton W. Gregg Memorial Scholarship <i>All Colleges</i></p>	<p>This scholarship was established through a bequest of Clifton W. Gregg, a 1915 graduate of the School of Commerce and Finance of Northeastern University. It was Mr. Gregg's request that "the income for this fund be used for the assistance of financially needy students." The award may be made annually. Recipients will be determined by the Committee on Scholarships.</p>

Rabbi Myer O. Grunberg Scholarship <i>All Colleges</i>	Established in 1953 by Mrs. Myer O. and Miss Rose Grunberg, this annual award is available to a senior student in any college of the University. The award is made to students who have evidenced in personal business and student relations those characteristics of leadership and human relations that make for a better social order. There is no restriction as to race, creed, color, or sex.
James F. Haley Scholarship Fund <i>Engineering</i>	This fund was established in 1984 through the generosity of Haley & Aldrich, Inc., a leading consulting engineering firm, and the family of Mr. James F. Haley, a distinguished civil engineering graduate and a member of the Class of 1939. The income from the fund is to be used to assist deserving students majoring in civil engineering who display soundness of character, a stable academic record, and financial need.
Priscilla E. Hargreaves Scholarship <i>Electrical Engineering</i>	The Priscilla E. Hargreaves Scholarship for Electrical Engineering Students was established by husband William Hargreaves, E'28, as a loving tribute to a wife whose love and devotion meant so much to him. Income from this fund will be awarded to electrical engineering students who have reached their second year and who show a need and have demonstrated reasonable academic responsibility.
Charles W. Havice Scholarship <i>All Colleges</i>	This scholarship was established by the members of the Student Union upon the retirement of the former Dean of Chapel, Charles W. Havice. The income from the fund is awarded annually to upperclass students who are active in the Student Union. Students should demonstrate a financial need.
Charles Hayden Memorial Scholarships <i>All Colleges</i>	The Charles Hayden Foundation, created by the will of the late Charles Hayden, an alumnus of the Boston English High School, offers annual memorial scholarships to freshmen at Northeastern University. The scholarships are awarded to "deserving boys" whose parents are unable to finance the entire cost of their education.
Oscar and Zelia Hodgkins Memorial Scholarship <i>Boston-Bouvé College of Human Development Professions</i>	<p>The Oscar and Zelia Hodgkins Memorial Scholarship Fund, established in 1986, provides financial assistance to students enrolled in Boston-Bouvé College who demonstrate financial need and academic achievement.</p> <p>This scholarship is awarded annually to an entering freshman and will continue for each subsequent year as long as the student remains in Boston-Bouvé College and demonstrates normal academic progress.</p>
Kathryn S. Horbal Scholarship <i>Chemical Engineering</i>	The Kathryn S. Horbal Scholarship for female chemical engineering students was established by Kathryn's family as a loving tribute to a daughter whose short lifetime meant so much to so many. Income from this fund will be awarded to female chemical engineering students who have reached at least their middler year and who have demonstrated academic responsibility.
Richard Melvin Horwitz Memorial Award for Excellence in Electrical Engineering <i>Engineering</i>	The Richard Melvin Horwitz Memorial Award for Excellence in Electrical Engineering was established in 1967 by Leonard J. Horwitz in memory of his brother, Richard Melvin Horwitz, a member of the Class of 1945 in the College of Engineering who died in action during World War II. The award recognizes academic achievement and excellence and is presented annually to an outstanding undergraduate senior majoring in electrical engineering.

The Walter F. Howe Memorial Scholarship <i>Business Administration</i>	<p>This fund was established in memory of Walter F. Howe, Class of 1968, who, within one week after graduation, was fatally wounded while pursuing thieves who had stolen his landlord's car. The scholarship was established through the generosity of Walter's friends and relatives in memory of his ideals of good citizenship and civic responsibility. It is awarded annually to a student in the College of Business Administration who demonstrates not only financial need but good citizenship and civic responsibility. The scholarship is open-ended so that additional sums can be added to it in future years and will be awarded by the University without restrictions as to race, color, geographic origin, or scholastic attainment.</p>
The Edward L. Hurtig Scholarship <i>All Colleges</i>	<p>This scholarship was established in 1968 through the generosity of the Hurtig family in memory of Edward L. Hurtig, an alumnus of the College of Engineering, Class of 1946. The scholarship is awarded annually to an entering freshman in the day colleges who has demonstrated the necessity for financial aid. Preferences will be given to recipients of the Supplemental Educational Opportunity Grants Scholarship Program of the United States Office of Education.</p>
The Maurice A. and Nellie L. Idelson Award <i>All Colleges</i>	<p>This award, established in 1968, is given annually to an entering freshman in the day colleges who has demonstrated the need for financial aid. Preference will be given to graduates of the Boston English High School. Should there be no qualified candidate from this source, the award will then be given to any worthy student.</p>
The Jamaican Associates, Inc., Scholarship <i>All Colleges</i>	<p>The Jamaican Associates, Inc., Scholarship, established in 1981 by the Jamaican Associates, Inc., is awarded annually to a student who is a citizen of Jamaica and who intends to return to Jamaica upon graduation or to a student who is of Jamaican descent. Preference will be given to a second-year student with demonstrable financial need and proven academic performance.</p>
Joseph Anthony Johnson Scholarships <i>Engineering</i>	<p>Established in 1968 by the will of the late Joseph Anthony (Johansen) Johnson of the Class of 1928, the income provides scholarship aid for students enrolled in the Department of Mechanical Engineering, with preference given to students of Scandinavian origin.</p>
Ralph P. Johnson Scholarship Fund <i>Electrical Engineering and Computer Science</i>	<p>Administered by the Office of Financial Aid and awarded to a computer science or electrical engineering major, this fund was established in 1980 by David R. Johnson, an alumnus of the Class of 1970, in honor of his father. It is the donor's desire that recipients of this fund assume the moral obligation to reimburse the fund in future years as they may be able in order to make additional financial aid available for other students.</p>
Dr. LeRoy C. Keagle Memorial Scholarship Fund <i>Pharmacy</i>	<p>The Dr. LeRoy C. Keagle Memorial Scholarship Fund was established in 1975 through the generosity of family and friends of Dr. LeRoy C. Keagle, a man of high integrity and commitment to the profession of pharmacy who, at the time of his death on December 15, 1974, was dean of the College of Pharmacy and Allied Health Professions at Northeastern University. The income from this scholarship fund is awarded annually to a student in the undergraduate pharmacy program who is entering the junior or senior class. Recipients must demonstrate financial need, academic stability, and soundness of character.</p>

Robert G. Keene Memorial Scholarship Fund <i>All Colleges</i>	This fund was established in 1979 in memory of Robert G. Keene, a graduate of Lincoln College, Class of 1972. The endowment funds were provided by the friends and associates of Robert G. Keene and by the Polaroid Corporation, where he served as an engineering manager. The income from the fund will be awarded annually to an undergraduate student who demonstrates financial need as well as strong character and initiative. Primary consideration will be given to children of Polaroid employees.
The Martin Luther King, Jr., Scholarship	The Martin Luther King, Jr., Scholarship is granted annually to incoming freshman, graduate, and transfer minority students who have demonstrated the philosophy of peaceful coexistence and change through nonviolent means espoused by Dr. King and who have an above-average scholastic record. The scholarship, in the amount of \$500, requires a minimum quality point average. Financial aid based on need is available to supplement the scholarship.
Andrew C. Knudsen Memorial Scholarship	The Andrew C. Knudsen Memorial Scholarship was established in 1982 by Johanna M. Knudsen in memory of her beloved brother, Andrew C. Knudsen, LI'52, B'55, who passed away on April 14, 1978. The scholarship award is to be made annually to two students, preferably one in the College of Engineering and one in the Alternative Freshman-Year program who have demonstrated leadership qualities, proven worthy, and are of good character with a financial need. The awards are to be made annually from the income of the fund.
Vena Morse Lamson Scholarships <i>All Colleges</i>	These scholarships are provided through the income of a fund established in 1963 by Horatio W. Lamson in memory of his beloved wife. They are awarded annually to needy and worthy students who are enrolled in any of the Basic Colleges of the University. The scholarships are granted by the Committee on Financial Aid of the University without regard to national origin, sex, race, or creed.
George M. and Irene M. Lane Scholarship Fund <i>All Colleges</i>	This scholarship fund was established in 1979 by the family of Dr. George M. Lane to honor his memory. Dr. Lane's faithful and dedicated service to Northeastern University extended from 1943 to 1975, at which time he retired as director of University Health Services. The income from the George M. and Irene M. Lane Scholarship Fund is awarded annually to an upperclass member of the University's varsity football or hockey team who demonstrates financial need, academic stability, and soundness of character. Additional family gifts as well as contributions from friends and associates may be added to the scholarship's endowment.
The Irving Landfield Scholarship <i>All Colleges</i>	This fund was established in 1972 through the generosity of Irving Landfield, a graduate of the School of Commerce and Finance of Northeastern University, Class of 1923. The income from the fund is to be awarded annually to help deserving and needy students who demonstrate a desire to fulfill the limits of their ability in academic and cooperative periods of study. The income from this fund will be administered and awarded by the University without restriction to race, color, creed, geographic origin, or scholastic attainment. It is Mr. Landfield's desire that recipients of the scholarship assume a moral obligation to contribute to the principal of this fund as they may be able, in order to make additional financial aid available for other students in later years.

<p>Avrom Aaron Leve Memorial Scholarship <i>Psychology</i></p>	<p>This scholarship fund was established in 1957 in memory of Dr. Avrom Aaron Leve, former Assistant Professor of Psychology. The interest is used annually to provide scholarships for upperclass students majoring in psychology. The award is made on the basis of academic achievement, financial need, and character.</p>
<p>The Austin T. and June Rockwell Levy Scholarship <i>All Colleges</i></p>	<p>This Fund was established in 1984 through the generosity of the June Rockwell Levy Foundation to assist deserving Rhode Island undergraduate students with tuition and living expenses. The fund memorializes the concern for the welfare of Rhode Island residents that was shared by Austin T. Levy, an innovator in business and philanthropy, and his wife, June Rockwell Levy.</p>
<p>William F. Linskey Scholarship Fund <i>All Colleges</i></p>	<p>This fund was established in March 1980 by alumni and friends of William F. Linskey, an athletic trainer long associated with young athletes in and around the Greater Boston area. A former head trainer for the Northeastern University football team and head hockey coach during the 1942–43 season, Linskey has served the City of Cambridge School Department as head athletic trainer and physical therapist for more than thirty years. The income from the fund will be awarded to worthy students pursuing courses leading to a Bachelor of Science in Education with a specialization in athletic training.</p>
<p>Russell T. Lowe Memorial Scholarship Fund <i>College of Engineering</i></p>	<p>This fund was established in 1976 in memory of Russell T. Lowe, a graduate of the College of Engineering, Class of 1953. The endowment funds were provided by the friends and associates of Russell Lowe and by the Barry Wright Corporation, where he served as a member of the Board of Directors and as president of the Industrial and Aero Products Group. The income from the fund will be awarded annually to one or more upperclass students enrolled in the College of Engineering. Preference will be given to mechanical engineering majors based upon demonstrable financial need and above-average scholastic achievement.</p>
<p>Edward J. Lynn Scholarship <i>College of Business Administration—Accounting</i></p>	<p>This fund was established in 1984 in honor of Edward J. Lynn upon his retirement by friends and associates and by The Continental Group where he served as controller. Mr. Lynn was responsible for establishing the extensive cooperative education relationships between Northeastern University and his company. The income from the fund will be awarded annually to an upperclass student enrolled in the accounting program of the College of Business Administration. Preference will be given to students who demonstrate financial need and above-average scholastic achievement.</p>
<p>Gilbert G. MacDonald Scholarship <i>All Colleges</i></p>	<p>This scholarship was established in 1981 by the family of Gilbert G. MacDonald, former vice president for student affairs and dean of students, and the members of the Student Union. The income from the fund will be awarded annually to upperclass students of proven ability and demonstrable financial need. Preference will be given to students who actively participate in the Student Union.</p>
<p>Dr. Reuben J. Margolin Memorial Scholarship Fund <i>Boston-Bouvé College of Human Development Professions</i></p>	<p>The Dr. Reuben J. Margolin Memorial Scholarship Fund was established in 1973 through the generosity of family and friends of Dr. Reuben J. Margolin, an outstanding and dedicated individual and friend who, at the time of his death on April 6, 1972, was chairman of the Department of Rehabilitation and Special Education at Northeastern University.</p> <p>The income from the Dr. Reuben J. Margolin Memorial Scholarship Fund is awarded annually to a deserving student admitted to or enrolled in the Graduate School of Boston-Bouvé College of Human Development Professions and</p>

majoring in rehabilitation and/or special education. Recipients must demonstrate financial need as well as the personal and professional qualities exemplified by Dr. Margolin.

George T. Marvin Scholarship Fund
All Colleges

This fund was established in 1961 under the provisions of the will of George T. Marvin, a graduate of the Northeastern University School of Law, Class of 1918. Mr. Marvin designated that the income of this fund should be used to provide financial assistance to worthy and needy students to assist them in furthering their education at Northeastern University.

George T. Marvin Scholarships may be awarded to new students seeking admission to Northeastern and to students enrolled as freshmen and upper-classmen. Applicants must have satisfactory records of scholarship as of the time of making application and must demonstrate genuine need and good citizenship.

**Merchants Tire Company
Scholarship Fund**
Business Administration

This scholarship was established in 1972 by Merchants Tire Company in honor of Max Katz, a Class of 1917 alumnus of Northeastern and founder and chairman of the board of Merchants Tire Company. The scholarship is awarded annually with selection preference given to a son or a daughter of a current employee of Merchants Tire Company enrolled as a freshman within the College of Business Administration, who demonstrates financial need, soundness of character, and academic stability.

**Dean Constantine N. Meriano
Memorial Scholarship**
*College of Pharmacy and
Allied Health Professions*

This scholarship, established by the Class of 1950 of the New England College of Pharmacy and subsequently supported by all Classes of the New England College of Pharmacy and the Northeastern University College of Pharmacy and Allied Health Professions, is named to honor the memory of Constantine N. Meriano, who was the founder, Dean and Chief Executive Officer of the New England College of Pharmacy until his retirement in 1957. In 1962 the New England College of Pharmacy merged with Northeastern University and is now known as the College of Pharmacy and Allied Health Professions. The scholarship is to be awarded annually to one or more students of the College. Selection will be made by the Committee on Scholarships and will be based on financial need, academic stability, and soundness of character.

**George H. Meserve, Jr.,
Scholarship Fund**
College of Arts and Sciences

This scholarship was established in 1979 through the generosity of Robert W. Meserve in honor of his brother, Professor George H. Meserve, Jr., an alumnus of the Class of 1925. Professor Meserve served Northeastern faithfully and with distinction for forty-two years, retiring in 1968 as professor and chairman of the Department of Art. Announced at the ceremony dedicating George H. Meserve Hall on the Boston campus, this scholarship benefits worthy undergraduate students who are majoring in art. Recipients should demonstrate financial need, academic stability, and soundness of character.

**Harash Mitroo Memorial Athletic
Scholarship**
All Colleges

This scholarship was established in 1983 through the generosity of the Mitroo family of New Delhi, India, in memory of Mr. and Mrs. Mitroo's son, Harash, a student in the College of Business Administration who was killed in an automobile accident in 1978. A talented artist and outstanding athlete, Harash received numerous awards for his paintings and for his athletic abilities, including a medal for his performance in an international cricket match against Ceylon. This scholarship is awarded annually, with preference given to international students, to a member of the varsity men's intercollegiate team in either basketball, football, hockey, or track, who demonstrates financial

need, soundness of character, and a spirit of good sportsmanship and fellowship. A trophy, designated as the Harash Mitroo Memorial Trophy in Athletics and inscribed with the names of scholarship recipients will be on permanent display at the University.

**The Clyde W. Morrison
Scholarship Fund**
All Colleges

This Clyde W. Morrison Scholarship was established in 1974 by Clyde W. Morrison, a member of the Class of 1942. The scholarship is to be awarded annually to a Braintree resident enrolled as a freshman, with a demonstrable financial need. Selection is made by the Committee on Scholarships.

**Morse Shoe, Inc.
Scholarship Fund**
College of Arts and Sciences

This fund was established in 1984 by Morse Shoe, Inc. Endowment income is to be used to provide scholarship assistance for an undergraduate who demonstrates financial need, academic stability and soundness of character. Preference will be given to students from Massachusetts.

**Frederick W. Muckenhaupt
Scholarship**
All Colleges

This award was established in 1961 by Dr. and Mrs. Carl F. Muckenhaupt in memory of their son, Frederick W. Muckenhaupt, Class of 1959 of the College of Engineering.

The award is to be made annually to a student in good standing on the basis of need. Preference is given to a student enrolled in the Department of Electrical Engineering.

**The Muro Pharmaceutical, Inc.
Scholarship**
Pharmacy

This annual scholarship was established in 1985 through the generosity of George D. Behrakis (Pharmacy '57), President, and his wife Margo. The fund is restricted to students in their middler, junior, or senior years who are pursuing the degree of Bachelor of Science in Pharmacy. Recipients must have demonstrated high academic ability and financial need.

**Elizabeth A. Neilson
Scholarship**
*Boston-Bouvé College of
Human Development Professions*

The Elizabeth A. Neilson Scholarship Fund was established in 1976 in memory of William H. and Anastasia Neilson, exemplars of the profession of health education during their lifetimes. The income from the scholarship fund is awarded annually to a student(s) with the highest scholastic record majoring in health education, who has completed eight quarters of academic study with at least four quarters having been taken at Boston-Bouvé College of Human Development Professions. The student(s) must typify the philosophy of the health education profession.

**Thomas Anthony Pappas
Scholarship Fund**
All Colleges

This fund was established in 1980 by the Thomas Anthony Pappas Charitable Foundation. Endowment income is to be used to provide scholarship assistance to needy students with high scholastic records.

**Power Systems Engineering
Grants-in-Aid**
Electrical Engineering

A number of public utilities and power equipment manufacturing companies in the northeastern part of the United States have made available grants-in-aid ranging from \$1,000 to \$5,000 to assist able freshmen who are interested in pursuing careers in power systems engineering through study programs leading to the Bachelor of Science or Master of Science in Electrical Engineering degrees. These awards are made on the basis of academic achievement in high school and aptitude for, and interest in, the field of power systems engineering, without regard to financial need.

Candidates for such grants-in-aid should apply to the Dean of Admissions at Northeastern University not later than March 1 of the year in which they wish to enter the College of Engineering.

Lawrence Harlow Pratt Athletic Scholarship Fund <i>All Colleges</i>	<p>This fund was established in 1979 by the Northeastern University Varsity Club in conjunction with the Athletic Development Program Fund Drive to honor and recognize Lawrence Harlow Pratt. For more than four decades, Larry was the spirit of Northeastern athletics. His greatest joys were the young men he persuaded to attend college. He encouraged them, cajoled them, sometimes scolded them, but always inspired them to complete their intercollegiate careers and go on to become outstanding members of the community. The income from the fund will be awarded annually to financially deserving varsity athlete(s).</p>
Charles Protaps Endowment Fund <i>All Colleges</i>	<p>This fund was transferred to Northeastern University in 1983. It was established through the will of Charles Protaps, a Lithuanian immigrant, who became a common laborer in this country. The purpose of the fund is to aid men and women of Lithuanian extraction to get a higher education.</p> <p>The income of this fund will be used to provide low interest loans of up to \$500 to needy and gifted students of Lithuanian extraction, who are pursuing a degree program at Northeastern University.</p> <p>Interest of 5 per cent will begin to accrue when the student either withdraws or graduates from Northeastern.</p>
The Gay Miller Reese Memorial Scholarship <i>Boston-Bouvé College of Human Development Professions</i>	<p>The Gay Miller Reese Memorial Scholarship was established in 1971 by Everett Reese, in memory of his wife, and by members of the Class of 1921 at their 50th reunion in honor of their classmate and class president, Gay Miller Reese. This scholarship is to be awarded annually to help a well-qualified upperclassman in Boston-Bouvé College of Human Development Professions acquire the education that could not otherwise be possible. The recipient of this award will be selected by the Committee on Scholarships.</p>
Regional Scholarships <i>All Colleges</i>	<p>Secondary school students who reside in rural areas of New England, who have demonstrated superior achievement in their studies, and who are strongly endorsed by their principals and guidance counselors may qualify for a Regional Scholarship. Scholarships range from \$200–\$1,400.</p>
The Myer Riesman Scholarship <i>Nursing</i>	<p>This fund, established in 1969 in memory of Myer Riesman, is used to provide financial assistance to deserving students in the College of Nursing. Preference is given to those students whose clinical experience is at Beth Israel Hospital.</p>
Edward T. Rigney Scholarship <i>All Colleges</i>	<p>A fund was established in 1978 by a grant from the Trans-Sonics Foundation in memory of Edward T. Rigney, member of the Class of 1941 and co-founder of Trans-Sonics, Inc. Income is awarded annually to a student showing financial need and promise of success in his/her chosen field and who is enrolled in engineering, science, or science-related studies. The scholarship may be granted to a freshman or upperclassman and may be renewed in succeeding years.</p>
Isedore Rosenthal Fund <i>College of Business Administration</i>	<p>The Isedore Rosenthal Fund was established in 1981 by Mrs. Isedore Rosenthal and friends in memory of her husband, a distinguished graduate of the School of Commerce and Finance (1925) and the School of Law (1931). Income from the fund is to be awarded each year, based on financial need, to freshman accounting majors for the purchase of books and materials. It is the donor's desire that recipients assume the responsibility in future years to contribute to the principal of this fund as they may be able, in order to make additional resources available for other students in later years.</p>

Thomas A. Rosse Scholarship <i>Science and Engineering</i>	<p>The Thomas A. Rosse scholarship was originally established in December, 1979, by the generosity of the Thomas A. Rosse family. The scholarship is to be awarded annually to science or engineering male student athletes who demonstrate financial need, academic stability, and soundness of character.</p>
Frank B. Sanborn Scholarship Fund <i>Engineering</i>	<p>The Frank B. Sanborn Scholarship Fund was established in 1958 to provide a scholarship or scholarships of not more than \$500 to worthy and needy students selected by the University, without restrictions as to race, creed, or geographic origin, but with preference being given to students majoring in electrical, mechanical, civil, or industrial engineering, in the order stated.</p> <p>Recipients must be willing to assume a moral obligation to reimburse the fund as they may be able, to make similar financial aid available for other students in later years. There shall be no interest charged and no time specified for reimbursement.</p>
Helen Seamans Schafer Scholarship <i>Business Administration</i>	<p>The Helen Seamans Schafer Scholarship Fund for Business Administration students was established by her husband, William T. Schafer, BA '31, as a loving tribute to his wife, Helen, whose love and devotion meant so much to him. Income from this fund will be awarded to upperclass students in the College of Business Administration. Consideration will be based upon financial need, academic stability, and soundness of character.</p>
Clinton H. Scovell Scholarships <i>Boston-Bouvé College of Human Development Professions</i>	<p>Scholarships are made available to men and women students in Boston-Bouvé College of Human Development Professions through a fund provided by the will of Clinton H. Scovell.</p>
Joseph M. Segel Scholarship <i>All Colleges</i>	<p>This scholarship fund was established January 9, 1981, by Martin F. Walsh, '52, and his wife, Pauline, to honor Joseph M. Segel on the occasion of his birthday. In 1964 Mr. Segel founded The Franklin Mint, which today is the nation's largest privately-owned mint.</p> <p>The entrepreneurial ethic of Mr. Segel is much the same as that demonstrated by many Northeastern alumni. Therefore, it is Mr. Segel's desire that recipients of this award demonstrate this quality and also show financial need.</p>
The Sidney L. Sholley Memorial Scholarship <i>All Colleges</i>	<p>The Sidney L. Sholley Memorial Scholarship has been established in memory of the founder and first president of Keystone Custodian Funds, Inc. Each year the trustees of the Sholley Foundation, Inc., provide a scholarship of \$3,500 to be awarded by the University to an outstanding incoming freshman student. The recipient is known as the Sidney L. Sholley Scholar.</p>
George A. and Lorraine C. Snell Scholarship <i>All Colleges</i>	<p>This fund was established in 1973 by Mr. George A. Snell, a graduate of the College of Engineering, Class of 1941, and a member of the Northeastern University Corporation and Board of Trustees, and his wife, Lorraine C. Snell.</p> <p>The income from the fund is to be awarded annually to one or more students enrolled in the basic colleges of Northeastern University. Selection will be made by the Committee on Scholarships based upon those candidates who demonstrate financial need, academic stability, and soundness of character.</p>
John Stuart Sousa, Jr., Memorial Scholarship Fund <i>Pharmacy</i>	<p>This scholarship was established in 1968 in memory of John S. Sousa, Jr., of Fall River, Massachusetts, a student in the College of Pharmacy, Class of 1969, by his family and friends. The scholarship is awarded annually with</p>

selection preference given to a male or female student entering his/her senior year in the College of Pharmacy and Allied Health Professions who has obtained a cumulative quality point average of 2.3, demonstrates financial need, participates in extracurricular activities, and is, preferably, a member of a fraternity or sorority.

**Southeastern Massachusetts
Pharmaceutical Association
Scholarship Fund**
*Pharmacy and Allied Health
Professions*

This scholarship was established in 1980 by the Southeastern Massachusetts Pharmaceutical Association. The income from the fund is awarded annually to one or more middler, junior, or senior students enrolled in the College of Pharmacy and Allied Health Professions who are residents of the area covered by the Southeastern Massachusetts Pharmaceutical Association (Greater Fall River, Greater New Bedford, and the Cape Cod areas). Recipients must be pharmacy majors and must demonstrate financial need, academic stability, and soundness of character.

**Lillian M. Spelman
Memorial Scholarship**
Nursing

This scholarship was established in 1979 by a bequest from Lillian M. Spelman, a resident of Boston who, as a public health nurse, dedicated her life to helping others. Her career began in the West End of Boston in the early 1900s. She served her country unselfishly as a Red Cross nurse in Europe during the First World War. Through this scholarship she continues to help others. Scholarship recipients must exhibit financial need as well as academic stability and soundness of character.

Spofford Scholarship Fund
All Colleges

The Spofford Scholarship is awarded annually to an American Negro, American Indian, or multiracial freshman who demonstrates severe financial need.

**The Stop & Shop
Companies, Inc.,
Student Loan Fund**
All Colleges

Established in 1974 by The Stop & Shop Companies, Inc., the Student Loan Fund is a combination endowment and revolving fund to be funded by \$100,000. This generous gift recognizes the contribution, in human terms, made through the years by Northeastern to Stop & Shop, which at the time the Loan Fund was established counted more than 120 Northeastern men and women in its executive ranks, seven of them vice presidents.

The Loan Fund will assist students who have a substantial investment in their education but are in need of some financial stimulus to aid them in completing their work.

**Student Loan Fund—
Health Professions**
*Boston-Bouvé College of
Human Development Professions,
Nursing, and Pharmacy and
Allied Health Professions*

In 1974, a foundation established a perpetual loan fund at Northeastern University to benefit full-time students enrolled as middle, juniors, and seniors in Boston-Bouvé College of Human Development Professions, the College of Nursing, and the College of Pharmacy and Allied Health Professions. This loan fund will aid those students who have a substantial investment in and commitment to the health professions and who require some financial help to complete their preparation.

**Ruth Page Sweet
Scholarship Fund**
*Boston-Bouvé College of
Human Development Professions*

This fund was established in 1959 by members of the Class of 1919 and alumnae of the Boston-Bouvé School in honor of their classmate, Miss Ruth Page Sweet, dean of women in the school from 1929 to 1946, administrative director from 1946 to 1948, and director from 1948 to 1958. The scholarship is presented to a junior or senior who has demonstrated a high level of professional promise indicated by academic record and extracurricular activities.

Alice Taylor Scholarship
All Colleges

Northeastern University recognizes that Alice Taylor, who passed away in 1982, is remembered as a positive force by the Mission Hill community and even more by the tenants of the Mission Hill Extension housing development.

Because of Ms. Taylor's contributions, the University has made available to five freshmen who are residents of Mission Hill Extension, full tuition Alice Taylor Scholarships for the freshman year.

**A. Gilbert Tenney
Scholarship Fund**
Engineering

This fund is in memory of A. Gilbert Tenney, who served as a captain in the Air Force during the Korean War and was killed while in active service. The income from the fund will be awarded to a needy student or students in the field of electrical engineering studying under the Cooperative Plan of Education.

**The Earl H. Thomson
Memorial Scholarship**
All Colleges

This fund was established in 1971 to honor the memory of Earl H. Thomson, a distinguished alumnus of the Class of 1925. Mr. Thomson became an internationally known trademark attorney as senior partner in the firm of Thomson and Thomson. A member of the Northeastern Corporation since 1958 and a trustee of the University since 1960, he was also a director of The National Council, former president of the Northeastern Alumni Association, and a member of the board of directors of Nu Epsilon Zeta fraternity.

This scholarship is awarded annually to one or more deserving and needy students enrolled as freshmen and/or upperclassmen who demonstrate a desire to fulfill the limits of their ability in academic and cooperative periods of study. The scholarship is open-ended so that additional sums can be added to it in future years and will be administered and awarded by the University without restrictions as to race, creed, geographic origin, or scholastic attainment. It would be Mr. Thomson's desire that scholarship recipients assume a moral obligation to reimburse this or other scholarship funds as they may be able, in order to make additional financial aid available for other students in later years.

**The Eliot F. Tozer
Memorial Scholarship**
*Business Administration
and Engineering*

This fund was established in 1972 through the generosity of the members of the Class of 1931 in memory of their faculty adviser, Eliot F. Tozer. The scholarship of \$750 is awarded annually to students of proven need in the middler, junior, or senior classes of the day colleges of engineering or business administration. The scholarship is open-ended so that additional sums can be added to it in future years, and will be administered and awarded by the University without restrictions as to race or creed.

Charles Irwin Travelli Scholarships
All Colleges

Numerous scholarships have been given yearly since 1932 to students demonstrating financial need, high academic achievement, and an active interest in University life as shown by participation in one or more major activities. Students are usually honored as recipients of Travelli Scholarships at the completion of their freshman year. Under normal circumstances, these awards will continue through the senior year.

Trustee Scholarships
All Colleges

Established in 1928 by the Board of Trustees of Northeastern University, these full- and partial-tuition scholarships are granted in the Basic Colleges each year to entering freshmen who have demonstrated superior scholastic attainment throughout their preparatory or high school courses.

**Robert E. Turner
Memorial Scholarship Fund**
Business Administration

This scholarship fund was established in 1978 through the generosity of family, friends, and colleagues in memory of Robert E. Turner, a 1952 graduate of Northeastern's College of Business Administration who was associated with the University for eighteen years. The income from this fund is awarded annually to assist a College of Business Administration undergraduate student majoring in accounting who demonstrates financial need, academic stability, and soundness of character.

Samuel Ulman Scholarship Fund <i>All Colleges</i>	<p>This fund was established in 1960 by Mrs. Samuel Ulman in memory of Samuel Ulman, a student at Northeastern University from 1912 to 1915. The purpose of the fund is to provide scholarship assistance to students in good academic standing who have financial need.</p>
University Scholarships <i>All Colleges</i>	<p>Northeastern University has for many years maintained a scholarship fund for deserving qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. The recipient of a Northeastern scholarship must be willing to assume a moral obligation to repay the University at some future date.</p>
The UPS Foundation Scholarship Fund <i>Business Administration</i>	<p>This endowed fund was established in 1982 by the UPS Foundation, the sponsored foundation of United Parcel Services, Inc. The income from this fund is awarded annually to undergraduate students enrolled in the College of Business Administration who demonstrate financial need, academic stability, and soundness of character. In providing scholarships, preference is given to students majoring in the transportation concentration or planning to enter the transportation industry.</p>
Sabestino Volpe Scholarship Fund <i>Engineering</i>	<p>The Sabestino Volpe Scholarship Fund was established in 1972 through the generosity of Mr. Sabestino Volpe, a distinguished alumnus of the College of Engineering and a member of the Class of 1928. The income from the fund is awarded annually as a scholarship to an upperclass student enrolled in the day civil engineering degree program within the College of Engineering. Recipients must demonstrate financial need, academic stability, and soundness of character.</p>
Henry Ellis Warren Scholarship Fund <i>All Colleges</i>	<p>This endowed fund was established in 1981 by the Warren Benevolent Fund, Inc., to honor the memory of Henry Ellis Warren of Ashland, Massachusetts. The income from this fund is awarded annually to undergraduate students who demonstrate financial need, academic stability, and soundness of character. In providing scholarships, preference is given to students from Ashland or contiguous communities.</p>
The Jacob Wasserman Scholarship <i>Pharmacy</i>	<p>Established in 1966 by his friends in memory of Jacob Wasserman, this fund is to provide scholarship aid to a senior student in the College of Pharmacy and Allied Health Professions. The award will be made annually on the basis of financial need, academic performance, and personal qualities.</p>
WCVB Boston Scholarship for a Minority Student in Broadcast Communication <i>College of Arts and Science</i>	<p>This scholarship was established in 1984 by WCVB-TV Boston. The income from the fund is awarded annually to a junior, senior, or graduate minority student in broadcast communication, with preference given to a black, Spanish, Oriental, or American Indian who is economically disadvantaged and to individuals who are residents of the New England states. The recipient must be an American citizen and taking courses in newswriting and/or T.V. news production, and other required journalism courses. The scholarship is administered by the Department of Journalism in conjunction with the Office of Financial Aid.</p>
Robert W. Yesucevitz Memorial Scholarship <i>Criminal Justice</i>	<p>This scholarship fund was established in 1983 in memory of Robert W. Yesucevitz, a federal police officer employed by the United States Federal Protective Service. Officer Yesucevitz was killed in the line of duty while serving at the John F. Kennedy Presidential Library, and this memorial was created by his</p>

family and friends, including many police officers. The income from the fund is awarded annually to a first-year student in the College of Criminal Justice who demonstrates academic promise and financial need.

Joseph P. Zabilski
Athletic Scholarship Fund
All Basic Colleges

This fund was established by the Northeastern University Varsity Club in recognition of Joseph P. Zabilski's thirty-five years of service to Northeastern University. Mr. Zabilski served with high distinction as teacher, varsity athletic coach, and athletic director. His dedication, enthusiasm, and loyalty to the Northeastern student athlete provided a model for all to emulate. It is with great pride that the Varsity Club membership provides this award in his name.

Other Scholarships

The following scholarships are funded by outside sources. Traditionally, Northeastern University students have been awarded these funds.

Recommendation for the specific award is made by one of the several college scholarship committees or the departments concerned, in conjunction with the Office of Financial Aid. If you feel you are a potential recipient for any of these awards, notify your financial aid counselor in writing.

Dr. Martin E. Adamo
Scholarship
Pharmacy

This scholarship of \$100 is given annually by the Boston Association of Retail Druggists in memory of Dr. Martin E. Adamo, the second president of the New England College of Pharmacy.

American Foundation for
Pharmaceutical Education
Scholarships
Pharmacy

The Board of Grants of the American Foundation for Pharmaceutical Education provides \$600 to be drawn upon to aid qualified students in the upper three years who are in the upper quarter of their class and who maintain a "B" or higher grade average. It is understood that the students have received or are eligible to receive assistance in an amount at least equal to the grant provided by the Foundation from other University sources in payment of required college expenses. The use of the grant is restricted to the payment of tuition or other required college fees. The recipients are identified as "Scholars of the American Foundation for Pharmaceutical Education."

The Boston Paper Trades
Association, Inc., Scholarship
Business Administration

Established in 1966 by the Boston Paper Trades Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated, by cooperative work achievement and extracurricular activities, an interest and potential in the field of sales. The recipient must be of high character, have a good academic record, and be able to demonstrate financial need.

Boston Society of Civil
Engineers Scholarship
In Memory of
Desmond FitzGerald
Civil Engineering

In 1931, the Boston Society of Civil Engineers established a scholarship in memory of Desmond FitzGerald, a former president of the Society and eminent hydraulic engineer with a distinguished record of service.

It has been awarded annually since 1931 to an outstanding Northeastern University senior or junior student in the Department of Civil Engineering of the College of Engineering. The presentation is made by the president of the Boston Society of Civil Engineers at the Society's annual meeting in the spring.

Burroughs Wellcome Revolving Loan Fund <i>Pharmacy</i>	A revolving loan fund was established by the Burroughs Wellcome Pharmacy Education Program to assist deserving pharmacy students in the completion of their education. This fund is established through the assistance of Richard M. Walent, Sheldon Rubin, Fred Matula, Daniel Venuti, and James Harb, members of the National Association of Retail Druggists.
The William M. Cavanaugh Memorial Scholarship <i>All Colleges</i>	This award, established by the members of the Publicity Club of Boston, is open to men and women of the junior and senior classes who demonstrate talent in the field of communications. The scholarship of \$100 bears the name of the second president of the Publicity Club (1950–1951), who was an able and successful newspaperman.
Civil Engineering Department Award <i>Civil Engineering</i>	The Civil Engineering Department Award was established by members of that Department to recognize achievement and give financial assistance to a student who has selected a major in the field of civil engineering. This award, in the amount of \$100, is financed by gifts from members of the Civil Engineering Department and is awarded to the recipient at the beginning of the sophomore year.
Consumer Value Stores Scholarship <i>Pharmacy</i>	Preference will be given to a student entering the senior year who will be seeking a career in community pharmacy practice. Students who are working or have worked for Consumer Value Stores will be given added consideration. The final selection will be made on the basis of demonstrated financial need, personal qualifications, and a sound academic record. Two \$500 scholarships are offered each year.
Electrical Manufacturers Representatives Club of New England, Inc., Scholarship <i>Electrical Engineering</i>	Established in 1958, this scholarship of \$475 is granted to a student or students majoring in electrical engineering, without regard to race, creed, or color. To qualify, students must have real financial need and excellent scholastic standing.
Frissora Family Scholarship Award <i>Engineering (Science majors)</i>	This award was established by the Frissora family in 1972. Awards are made to freshmen entering Northeastern University, based upon their high school scholastic record and financial need. Preference is given to students of Italian-American extraction who are pursuing an education in a technically oriented curriculum such as engineering, science, mathematics, premedicine, or nursing. Application for this scholarship award must be made through the Grand Lodge of Massachusetts, Order of Sons of Italy in America, 126 Cambridge Street, Boston, Massachusetts. Students selected will receive a grant of \$300 per year for four years. Funds will be paid directly to Northeastern University.
Gillman Brothers, Inc., Scholarship <i>Pharmacy</i>	This scholarship of \$250 is given annually by Gillman Brothers, Inc., to help students further their education in pharmacy.
Massachusetts State Pharmaceutical Association Scholarship <i>Pharmacy</i>	This scholarship of \$200, established by the Massachusetts State Pharmaceutical Association, is awarded annually. The recipient must be a resident of Massachusetts. The Massachusetts State Pharmaceutical Association also awards a number of scholarships of \$100. Applications for those scholarships may be secured from the office of the Association at 11 Beacon Street, Boston.

McKesson and Robbins, Inc., Scholarship Award <i>Pharmacy</i>	This award of \$200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student who is in financial need. The award recipient is determined by the College of Pharmacy Scholarship Committee and the Office of Financial Aid.
The New England Paper Merchants, Inc., Scholarship <i>All Colleges</i>	Established in 1959 by the New England Paper Merchants Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by cooperative work achievement and extracurricular activities an interest and potential in the field of sales. The recipient must be of high character, be able to demonstrate financial need, and have a good academic record.
Norfolk County Pharmaceutical Association Scholarship <i>Pharmacy</i>	This scholarship of \$50 is awarded annually to a student who meets the requirements both financially and scholastically and is a resident of one of the member towns covered by the Norfolk County Pharmaceutical Association (Norwood, Dedham, Canton, Walpole, Millis, Needham, Westwood, and Islington, in Massachusetts).
Connecticut Alumni Rudolf O. Oberg Scholarships <i>All Colleges</i>	Each year the Connecticut Alumni Club awards scholarships to students from Connecticut who have achieved a high academic average in their freshman year and have demonstrated financial need. The scholarships are to be used toward the tuition expense of the sophomore year. These scholarships were established in 1958 to promote Northeastern University among the preparatory schools of Connecticut and, in 1971, were named to honor Rudolf O. Oberg, the former director of alumni relations.
The Phi Kappa Phi Scholarship <i>All Colleges</i>	Established in 1982 by the University's Chapter of Phi Kappa Phi, the national interdisciplinary honor society, the scholarship is available to a student transferring from Roxbury Community College. The nomination is made by the president of Roxbury Community College in accordance with criteria established by the University's chapter.
South Middlesex Pharmaceutical Association <i>Pharmacy</i>	This tuition scholarship of \$100 established in 1960 is awarded annually to a pharmacy student enrolled in the third, fourth, or fifth year who is in good scholastic standing and in financial need, and living in the area covered by the South Middlesex Pharmaceutical Association (Arlington, Belmont, Lexington, and Watertown, Massachusetts). The recipient will be selected by the Scholarship Committee.
South Shore Pharmaceutical Association Scholarship <i>Pharmacy</i>	In June of each year, the Scholarship Committee of the Association will select a freshman living in the area covered by the South Shore Pharmaceutical Association (Quincy, Braintree, Weymouth, Hull, Randolph, Hingham, Holbrook, and Cohasset, Massachusetts), who will be awarded a \$100 scholarship to be applied to the tuition of the first semester of the sophomore year.

**Ernest L. Spencer
Scholarship Award**
Civil Engineering

Established in 1975 by the family and friends of Ernest L. Spencer as a memorial, this award is administered by Chi Epsilon, honor society for civil engineers. Professor Spencer, chairman of the Civil Engineering Department from 1963 until his death in 1975, was a member of the Northeastern University faculty for 36 years.

At the present time income from the endowment provides an annual award of \$500. Nominees are selected from the senior class of civil engineering students by the department scholarship committee. Criteria on which the award is based include high academic achievement, active participation in student affairs, and evidence of superior professional promise as demonstrated by high evaluations on cooperative work assignments.

**Springfield Druggists'
Association Scholarship**
Pharmacy

A scholarship of \$100 is offered by the Springfield Druggists' Association. This is to be awarded to a sophomore or junior who maintains the highest average in the Department of Pharmacy and who is worthy and in need of financial assistance. The Springfield Druggists' Association Scholarship Fund was established in 1956.

Honor Societies and Awards

The University encourages the achievement of excellence in scholarship by making monetary awards and chartering honor societies in the various academic disciplines.

Honor Societies

The following honor societies are chartered in the Colleges:

The Academy—in the College of Arts and Sciences
Alpha Kappa Delta—in the College of Arts and Sciences, Department of Sociology and Anthropology
Alpha Phi Sigma—in the College of Criminal Justice
Alpha Pi Mu—in the College of Engineering, Department of Industrial Engineering and Information Systems
Beta Alpha Psi—in the College of Business Administration, Accounting concentration
Beta Gamma Sigma—in the College of Business Administration (Massachusetts Delta Chapter)
Boston-Bouvé College of Human Development Professions Honor Society—in the College, all Departments
Chi Epsilon—in the College of Engineering, Department of Civil Engineering
Delta Phi Alpha—national German honor society
Eta Kappa Nu—in the College of Engineering, Department of Electrical Engineering (Gamma Beta Chapter)
Kappa Delta Pi—in the Boston-Bouvé College of Human Development Professions
Omega Chi Epsilon—in the College of Engineering, Department of Chemical Engineering
Phi Alpha Theta—in the College of Arts and Sciences, Department of History (Northeastern Zeta Tau Chapter)
Phi Kappa Phi—national interdisciplinary honor society
Phi Sigma—in the College of Arts and Sciences, Department of Biology
Phi Sigma Iota—in the College of Arts and Sciences, Romance Languages (Iota Zeta Chapter)
Pi Sigma Alpha—in the College of Arts and Sciences, Department of Political Science (Northeastern Delta Gamma Chapter)
Pi Tau Sigma—in the College of Engineering, Department of Mechanical Engineering (Northeastern Tau Chapter)
Rho Chi Society—in the College of Pharmacy and Allied Health Professions (Beta Tau Chapter)
Sigma Epsilon Rho—in University College
Sigma Theta Tau—in the College of Nursing
Sigma Xi—Scientific Research Society of North America
Tau Alpha Pi—in the School of Engineering Technology (national engineering technology honor society)
Tau Beta Pi—in the College of Engineering (Massachusetts Epsilon Chapter)

Election to the college honor societies is based primarily upon scholarship, but, before a man or woman is privileged to wear the honor society insignia, there must be evidence of an integrity of character. The societies have memberships consisting of the outstanding men and women in the colleges. Election to an honor society is among the highest honors that can be conferred upon an undergraduate.

Awards for Upperclassmen

University awards are determined by scholastic and citizenship achievement. They are presented by appropriate committees headed by the Dean of Students.

The Academy Award *Arts and Sciences*

The Academy, the honor society of the College of Arts and Sciences, offers an annual award of \$100 to the sophomore in the College of Arts and Sciences who, during the previous year as a freshman, achieved the highest scholastic record.

William Jefferson Alcott, Jr., Award *All Colleges*

This award of \$200 was established in 1934 by members of the faculty and other friends to perpetuate the memory of William Jefferson Alcott, Jr., a brilliant member of the Northeastern Department of Mathematics from 1924 until his death in 1933. The annual award to a senior is made from the income of the fund "for outstanding performance, either in the way of unusual excellence in routine work or in connection with some intellectual activity outside or beyond the requirements of the curriculum."

Alumni Awards for Professional Promise *All Colleges*

Established in 1947 by the Alumni Association, these awards are presented annually at an Alumni Association meeting in the spring of the year. The awards are made to the outstanding seniors in each of the Basic Colleges and in University and in the School of Engineering Technology who have demonstrated unusual professional promise through their character traits, scholastic achievement, and cooperative work performance.

The Beta Gamma Sigma Society Award *Business Administration*

"The purpose of this society shall be to encourage and reward scholarship and accomplishment among students of business administration, to promote the advancement of education in the art and science of business, and to foster integrity in the conduct of business operators."

Election to membership in Beta Gamma Sigma is the highest scholastic honor open to a student in business administration.

The Massachusetts Delta Chapter of Beta Gamma Sigma, the national honor society of colleges of business administration, offers an annual scholarship of \$100 to the sophomore in the College of Business Administration who, during the previous year as a freshman, achieved the highest scholastic record.

Boston-Bouvé College of Human Development Professions Honor Society Awards *Boston-Bouvé College of Human Development Professions*

The Society offers an annual award of \$100 to the sophomore in Boston-Bouvé College of Human Development Professions who, during the previous year as a freshman in the College, achieved the highest scholastic record. Each student voted into the society receives an engraved certificate at a special Honors Assembly.

Cooperative Education Awards *All Colleges*

These awards are presented to seniors in the Basic Colleges in recognition of outstanding performance in the Cooperative Education Program, through which they have personified the objectives and ideals of the University. The awards are presented at the Annual Awards Luncheon.

Sears B. Condit Honor Awards <i>All Colleges</i>	<p>These awards were established in 1940 through the generosity of Sears B. Condit. On Honors Day, Sears B. Condit Honor Awards are presented annually to outstanding students in the senior class. Each award carries a stipend as well as a certificate of achievement.</p>
Joseph Arthur Coolidge Achievement Awards <i>Physical Sciences</i>	<p>Established in 1977 with funds provided by the will of Joseph A. Coolidge, a distinguished member of the Northeastern University faculty from 1911 to 1954 and chairman of the Department of Physics from 1912 to 1935, three awards of \$500 each are granted annually to the outstanding sophomore, middler, and junior physical sciences students. These awards are based primarily on distinguished academic achievement, with additional consideration given to soundness of character, participation in extracurricular activities on and off campus, and qualities of leadership. Preference will be given to students majoring in physics, mathematics, or other physical sciences.</p>
Richard Cardinal Cushing Scholarship <i>All Colleges</i>	<p>The Richard Cardinal Cushing Scholarship was established in 1978 through the generosity of the Massachusetts Committee of Catholics, Protestants, and Jews. The income from the scholarship's endowment is awarded annually to a Catholic, a Protestant, and a Jewish student who embody the principles of brotherhood and justice and who, through their work on campus, have become positive forces for religious understanding.</p>
Director's Award	<p>The Director's Award of \$100 is made annually by the director of the African-American Institute to the individual judged by the director to be the most outstanding black senior. The award is based on involvement in African-American Institute programs and scholarship, as well as interaction with the community at large. The award is presented at the Awards and Unity Banquet in June.</p>
Alfred J. Ferretti Award <i>Engineering</i>	<p>Tau Kappa Chapter of Pi Tau Sigma, the mechanical engineering national honor fraternity, sponsors an annual award to the sophomore mechanical engineering student at Northeastern having the highest scholastic standing. The award is named in honor of Professor Ferretti, who retired June 30, 1961, after forty-three years of service to the University.</p>
Alfred J. and Laura M. Ferretti Scholarship <i>Engineering</i>	<p>This scholarship was established in 1978 by Professor Alfred J. Ferretti, who retired in 1961 after forty-three years of service to Northeastern University. It honors the memory of Mrs. Ferretti and is to benefit worthy undergraduate students who are majoring in mechanical engineering. Recipients should demonstrate high academic achievement by maintaining a minimum average of 3.0 and should be of sound character.</p>
Luis de Flores Endowment Fund <i>All Colleges</i>	<p>This fund was established in 1964 to provide yearly awards to students in recognition of superior ingenuity, irrespective of general academic standing.</p>
Clara and Joseph F. Ford Awards <i>All Colleges</i>	<p>The Ford Awards are made to students who have shown a democratic and tolerant spirit and who are well disposed toward people of all creeds and races. They are chosen from the senior class and judged on the basis of their contributions through participation or leadership and their extracurricular organizations. Students must have demonstrated by their actions that they are particularly tolerant and willing to work with and for other people.</p>

The Lillian Gilbreth Award <i>Engineering</i>	A cash award is presented at the annual Engineering Honors Banquet to the outstanding senior in the Department of Industrial Engineering and Information Systems. Named in honor of the first woman industrial engineer, the award was established in 1986 by Carolyn M. Jack, a 1984 graduate, to recognize academic excellence and service to the University and the community. The recipient is selected by the department chairman and the faculty adviser and president of Alpha Pi Mu honor society.
The Harold D. Hodgkinson Achievement Awards <i>All Colleges</i>	Established in 1954, the Harold D. Hodgkinson Achievement Awards of \$1,000 each are granted annually to a senior student in Division A and Division B. The winners of the awards are known as the Hodgkinson Scholars for the year in which they are chosen. The award is based primarily upon distinguished scholastic achievement with due consideration of character, personality, qualities of leadership, cooperative work experience, military record (if any), and service in voluntary organizations and activities. Student leadership accomplishments and professional potential are evaluated in connection with these criteria. The Hodgkinson Scholars are chosen by a committee of administrative members of the faculty. An appropriate certificate is presented to each recipient as a permanent record of his/her selection.
Kappa Delta Pi Award <i>Boston-Bouvé College of Human Development Professions</i>	Kappa Delta Phi honor society offers an annual award of \$100 to the sophomore who, during the freshman year, achieved the highest scholastic record.
Robert D. Klein Memorial Scholarship <i>Arts and Sciences</i>	This scholarship was established in 1981 through the generosity of family, friends, and colleagues of Professor Klein, who joined the Northeastern University faculty in 1957, served as acting chairman of the Department of Mathematics between 1969 and 1970 and, from 1977 until his death in 1978, was a professor of mathematics. The scholarship is awarded annually to a freshman student enrolled in the College of Arts and Sciences who demonstrates consistent effort and academic achievement in remedial mathematics, the educational program to which Professor Klein contributed so significantly.
Joseph C. Lawler Memorial Scholarship <i>Civil Engineering</i>	This scholarship was established in 1982 by family, friends and colleagues in memory of Joseph C. Lawler, an alumnus of the College of Engineering, Class of 1943 and a recipient of a University honorary degree in 1972. Mr. Lawler was a member of Northeastern's Corporation and Board of Trustees. He was chairman and chief executive officer of Camp Dresser & McKee, Inc., the firm where he began his employment as a co-op student of Northeastern. A \$2,000 award will be made annually to an upperclass (middler, junior, or senior) full-time undergraduate civil engineering day student who demonstrates exceptional professional promise. Criteria include academic performance, cooperative employer recommendations, demonstrated leadership abilities and/or community service activities.
The Lilly Achievement Award <i>Pharmacy</i>	The Lilly Achievement Award is given to a graduating senior for superior scholastic and professional achievement. Leadership qualities, professional attitudes, and academic performance will be considered in the selection of the individual for this award.
McKesson & Robbins, Inc., Scholarship <i>Pharmacy</i>	This scholarship of \$200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student in financial need.

Susan L. Orchard Memorial Fund <i>All Colleges</i>	<p>In 1978, the Susan L. Orchard Memorial Fund was established at Northeastern in memory of Susan L. Orchard, a former University student. Reflecting Susan's interest in improving the quality of life and opportunities for women, the annual income of this fund will be awarded to mothers pursuing their studies at Northeastern who require financial assistance in order for their children to make use of the University's day care center. Recipients will be selected by the center's director and advisory committee.</p>
The Phi Sigma Society Award <i>Arts and Sciences</i>	<p>Phi Sigma, honor society in the Department of Biology, offers an annual award of \$50 to the junior or senior majoring in biology or a related science who demonstrates the greatest research potential. To qualify for the award, the student must be a member of Phi Sigma.</p>
Roland Guyer Porter Memorial Fund <i>Electrical Engineering</i>	<p>This fund was established in 1953 by colleagues and friends of the late Professor Roland G. Porter, for many years the head of the Department of Electrical Engineering. Interest from the fund provides an annual award to a student in the Department of Electrical Engineering who best exemplifies the qualities of mind and character that Professor Porter did so much to develop in his lifetime.</p>
President's Awards <i>All Colleges</i>	<p>On the annual Honors Day, six awards of \$500 each, known as the President's Awards, are presented to the students with the highest records in both divisions of the sophomore, middler, and junior classes.</p>
The William Rand Award <i>Engineering</i>	<p>The Massachusetts Epsilon Chapter of Tau Beta Pi annually offers an award to the outstanding middler in the College of Engineering. The award is based upon outstanding scholarship, breadth of interest, and contribution to the University. All middleers with a 3.5 average or above are eligible; the winner is chosen after careful screening and interviews with members of the chapter.</p>
ROTC Awards ROTC	<p>Awards totaling \$1,000 are available to ROTC cadets each year. The University offers ten \$50 awards annually—four to sophomores, four to middleers, and two to juniors.</p> <p>Scabbard and Blade (the cadet officers' honor society) offers one award annually to middleers. The Pershing Rifles (the basic-course honor society) offers a \$50 award to a sophomore Pershing Rifles cadet.</p> <p>Academic Achievement Awards are won by each cadet in the top 10 percent of ROTC classes. This award, a wreath, is worn above the right breast pocket of the uniform during the year immediately following the year it is earned. Leadership Achievement Awards, consisting of letters of commendation, are awarded to each cadet in the top 10 percent in leadership potential.</p> <p>Many medals and trophies are also awarded by other organizations to ROTC cadets for achievements in diverse fields.</p>
Nguzo Saba Award <i>Office of Minority Students Affairs</i>	<p>Two Nguzo Saba Awards are presented each year by the African-American Institute to the black male and female who have proved themselves of invaluable service to the black community of Northeastern University and Boston. The award is in the amount of \$100 and is presented at the Awards and Unity Banquet.</p>
Sigma Theta <i>Nursing</i>	<p>Sigma Theta, the honor society in the College of Nursing, annually offers an award of \$100 to the sophomore in the College of Nursing who, during the previous year as a freshman, achieved the highest scholastic record.</p>

**Professor Joseph Spear Fund
for Excellence in Student
Activities**
All Colleges

This fund was established by the College of Engineering Class of 1923 in recognition of Professor Spear, class adviser and mentor. It was through Professor Spear's devotion and concern for the well-being of the students that he developed and promoted student activities at Northeastern University. Professor Spear has been referred to as the "Father of Student Activities." The purpose of this fund is to provide a source of income that can be awarded annually to juniors and seniors who have made outstanding contributions to student activities.

Max Starr Award
Business Administration

The Max Starr Award in Public Accounting was established in 1968 by the Max Starr Foundation to recognize every other year an outstanding member of the junior class in the College of Business Administration preparing for a career in public accounting. The recipient is chosen on the basis of both academic and cooperative work records as well as personal qualities. The student receives awards of \$250 in both the junior and senior years.

**The Dr. Ruth E. Sullivan
Memorial Scholarship Fund**
Arts and Sciences

This fund was established at Northeastern University in 1976 through the generosity of family, friends, and colleagues of Dr. Sullivan, who was a member of the Department of English from 1968 until her death in 1976. One scholarship is awarded annually to an undergraduate senior who demonstrates academic achievement and excellence in interdisciplinary studies in the liberal arts, such as literature and psychology, the fields to which Dr. Sullivan contributed so significantly.

Tau Beta Pi Award
Engineering

Massachusetts Epsilon Chapter of Tau Beta Pi Association, national honor society in engineering, annually offers a scholarship of \$100 to the sophomore in the College of Engineering who, during the previous year as a freshman, made the highest scholastic record.

Today's theme:

DISCOVERY AND CREATION

"The Real Thing"

by Henry James (1843-1916)

"The Second Tree

from the Corner"



Student Support Services and Resources

University Libraries

Alan R. Benenfeld, B.Met.E., M.L.S., M.S., *Dean and Director*

Together, the collections, services, staff, and facilities of the Northeastern University Libraries provide access to information, and an understanding of the organization of the literature and other information resources of the academic disciplines. In so doing, the Library is integral to the academic and research processes, whether these occur in a formal classroom, seminar, or laboratory setting or through individual study and enrichment.

Libraries

The University Libraries include seven facilities of which Dodge, on the Boston campus, is the main library. Dodge houses the materials that support the University's programs in the humanities, social sciences, fine arts, education, engineering, criminal justice, nursing, business, and at the undergraduate level, in the sciences.

Also located on the Boston campus are three libraries which house graduate-level collections in physics and electrical engineering, in mathematics and psychology, and in chemistry, biology, pharmacy, and allied health. In addition, there are three libraries that support the academic programs at the Burlington and Dedham campuses and at the Marine Science and Maritime Studies Center in Nahant.

The University is presently planning a new central library for the Boston campus. It will more than double the amount of space available to house and use the library's collections and services and for study. This new facility is being designed to incorporate the latest online, telecommunications and media technologies into all library services.

Collections

The total holdings of the University Libraries include the equivalent of more than one million volumes in print and in microform, and current subscriptions to approximately 5,000 serial titles and 24,000 items in audiovisual and computer software formats. The Library also collects other types of materials such as scores, maps and atlases, technical reports, and government documents.

The collections are especially strong in the sciences, engineering, business, criminal justice, and nursing. Among the many special series available in microformat are important collections in anthropology, education, government, history, literature, and business. In addition to a large reference collection in Dodge, there are specialized reference collections in each of the libraries.

Dodge Library is a federal depository and actively maintains over 250,000 documents, reports, and other publications made available through the U.S. Government Printing Office. Strengths of the documents collection include Congressional hearings and reports, census materials, and publications issued by the Departments of Commerce, Justice, Health and Human Services, and Housing and Urban Development.

In the main library, the Learning Resources Center provides microcomputer facilities, language and music listening laboratories, and an extensive set of self-paced media materials, in varied interactive formats, including audiotapes, videotapes, filmstrips, cassettes, recordings, and computer-assisted lessons and exercises.

The University Archives serves as a depository for the historical records of the University. The collection also includes faculty publications, student yearbooks, Northeastern dissertations, and other University publications.

Services

Library staff are available in all service areas to assist students in both retrieving and using the resources in the University Libraries. Computer printouts located at various service areas may be consulted to determine if a book is checked out, on order, on reserve, or in storage. The circulation staff provide a search service for students who are unable to locate a book on the shelf.

A series of publications are prepared by the library staff to acquaint students with the collections in the University Libraries and to help students with their research. These include short guides to types of resources, such as encyclopedias and periodicals, to resources in particular disciplines, such as economics and nursing, or in specific subjects, such as science fiction and caribbean music.

In each unit of the University Libraries, librarians provide reference assistance. In addition, librarians provide instruction to groups and to individuals on the bibliographic research process and on strategies for locating and using library resources. Each quarter, a series of tutorials is offered giving students further opportunities to meet with a librarian to discuss particular or specialized research needs.

Computer-assisted instruction and microcomputer facilities are available in the Learning Resources Center's Microcomputer Lab. The Center's staff also coordinate a peer tutoring program, available to students at no cost.

Online retrieval of information from more than 150 databases is provided, for a fee, through the Library's Computer Search Services. Citations, often with abstracts, typically are to journal articles, dissertations, technical reports, and symposia. The Librarian who conducts the online search can advise the student of the cost for this service.

A variety of finding aids, such as union lists of serials, are available in each library for consultation should needed materials not be in the collections of the University Libraries. Assistance in using such aids is available from staff; in addition, Interlibrary Loan staff may also conduct a computerized location search. Under certain conditions, students may be able to borrow materials through Interlibrary Loan.

Northeastern University is a member of the Boston Library Consortium, a cooperative arrangement among the following academic and research institutions: Boston College, Boston Public Library, Boston University, Brandeis, MIT, the State Library of Massachusetts, Tufts University, the University of Massachusetts (Amherst, Boston, and Worcester campuses), and Wellesley College. The University's membership in the Boston Library Consortium generally allows for on-site use by, but does not grant borrowing privileges to, students at Northeastern. Some of the Consortium libraries and many of the other libraries in the Boston area require that a visiting student present a special pass or letter of introduction. A Northeastern reference librarian can advise about such student visitor policies.

Freshman Orientation Programs

Harvey Vetstein, B.A., M.A., C.A.G.S. *Associate Dean and Director*

Except for the visits students will make to the Admissions Office, the first opportunity to learn about Northeastern and to meet classmates, administrators, faculty members, and advisers will come during the freshman orientation period.

The program for orientation is planned and supervised by the Director of Orientation who will see to it that students are introduced to the customs and people that make up the University. At that time, registration, class schedules, and other procedures and details necessary for enrollment will be completed.

During the orientation period, in accordance with a long-standing tradition, students will be welcomed by the President at a special convocation. They also will be able to meet with deans and others who will have important roles in their college careers.

Upperclass students generously volunteer their time to assist in setting up and running programs that provide opportunities for relaxation, recreation, and cultural enrichment. Members of the Dean of Students' staff are available during the orientation period and throughout the year to answer questions and provide assistance.

Office of Freshman Affairs

Anthony J. Bajdek, M.A., *Associate Dean and Director*

The Office of Freshman Affairs bears particular responsibility for monitoring and facilitating the academic progress of freshmen by providing academic and personal counseling and appropriate administrative action. Freshman Affairs applies academic policy, authorizes changes of major (both within and between colleges), and

prepares special course schedules for students who change their majors, as well as for those with advanced placement or advanced standing credit. In addition, the Office of Freshman Affairs surveys the academic status of all freshmen.

The staff identifies freshmen with deficient academic records for academic probation, authorizes summer corrective work, and reenters eligible students at the freshman level. Midway through each academic quarter, a computer-based Interim Academic Status Report system, involving progress reports prepared by instructors of freshmen, provides detailed evaluations for use by students and the 180 faculty who serve as their advisers. This evaluation is a preventive measure, designed to help detect and correct potentially failing freshmen.

To support the academic progress of freshmen, the Office of Freshman Affairs manages the freshman advisory system, and conducts appropriate research to measure the success of specific academic support activities and academic programs.

During the course of the year, the staff conducts special seminars designed to assist those freshmen identified as having difficulty. When students complete the three academic quarters of the freshman year, the Office of Freshman Affairs reviews their academic records to determine eligibility for sophomore status.

Academic Assistance Center

Maurice Kaufman, Ph.D., *Director*

The Academic Assistance Center is located at 151 Cahners Hall. The center offers a variety of services for students who wish to improve their academic performance and develop their reading and study skills. It also provides services for students having difficulty with coursework and for students with severe learning problems. The staff of the center diagnose academic problems, provide instruction, and make referrals when appropriate.

The center provides the opportunity for peer tutoring in subject areas, intensive reading and study skills workshops, and preparatory and review workshops in selected subjects. Students are encouraged to attend pertinent workshops which are announced each quarter.

Through its Reading Lab, the center helps students to develop reading comprehension, study habits, vocabulary, and related skills. At the Reading Lab, instruction is supplemented by supervised practice sessions.

Students should contact the center to receive help in diagnosing academic problems, to improve reading and study skills, and to arrange for group instruction or individual tutoring in specific subject areas. The center will refer students to other services available at Northeastern when that is appropriate. The Academic Assistance Center can be reached at 617-437-4300.

Preprofessional Advising

The Pre-Health Professions Advisory Committee, a University-wide group, offers preprofessional counseling for students interested in a career in medicine, dentistry, or related professional medical fields. The Committee members are available to discuss the various medical fields, minimum admissions requirements, and the application process.

For students preparing for a career in law, there are also a number of faculty members who can serve as advisers and resource personnel on related curricular and admissions questions.

In addition, the Department of Graduate Placement Services provides information and advice on procedures for admission, preparation of applications, and the scheduling of appropriate admissions tests.

For further information regarding the above, students should contact Gail Leclerc in 400 Meserve Hall.

The Reading Clinic

The Reading Clinic, located in Lake Hall, offers a wide range of diagnostic and corrective services for a variety of reading and language problems. It is open to persons of all ages, including University students. Faculty members are also qualified to administer such tests as the WAIS, WISC, BINET, ITPA, Bender, and most standardized instruments.

Speed Reading

The Department of Education of Boston-Bouvé College of Human Development Professions offers a noncredit course designed to improve skills and speed in critical and pleasure reading. Offered each academic quarter, the course is available at a reduced tuition rate to students, staff, and alumni of the University.

Hearing, Language, and Speech Clinic

Robert B. Redden, Ed.D., *Director*

The Hearing, Language, and Speech Clinic, 133 Forsyth Building, serves all members of the University community. Diagnostic evaluation and treatment are provided to clients who demonstrate a variety of communication disorders.

The Counseling and Testing Center

The purpose of the Counseling and Testing Center is to offer assistance to students in a wide variety of areas such as career planning, personal and life adjustment problems, study skills, anxiety, choice of major, improving academic progress, and interpersonal relationships. At the center, students are encouraged to discuss their concerns with a counselor. Following this they may decide to continue individual counseling, take psychological tests to increase their knowledge of themselves, join a group of students with whom they can share concerns, use self-help tapes, or make use of the center's extensive file of information about careers and services.

Academic Computer Services

Robert J. Fitzpatrick, B.S., *Acting Director*

Over the past few years the use of computers in scientific, business, and educational environments has been changing dramatically. First, punched cards were widely replaced by interactive video terminals; then personal computers vastly increased the number of people who have access to, and routinely use, computers. Of late, these personal computers have become more and more powerful at an ever decreasing cost.

Academic Computer Services, located in the basement of Richards Hall (telephone: 437-2334), supports the research activities of faculty, research personnel, and graduate students, as well as teaching and learning activities at both the graduate and undergraduate levels. The computational capability of this facility includes a variety of personal computers running under MS-DOS, linked in local area networks at the Boston, Burlington, and Dedham campuses. A wide area network also provides both students and faculty with time-sharing access to five large computers through video and hard-copy terminals arranged in clusters at all three campuses. The wide area network connects one Digital Equipment Corporation VAX-8650 system in Richards Hall plus an additional VAX 11/785 and a Data General MV/8000 in the Engineering Computer Center. This network also provides access through a number of dial-in telephone lines, primarily for faculty use, to all five computers.

Effective utilization of all facilities is promoted by the availability of programming assistance at all three campuses. A variety of graphics and output devices are also available. Electronic spreadsheet and word processing packages are available, as well as numerous software libraries for numerical, statistical, and financial applications. The primary languages supported for those who choose to do their own programming are FORTRAN, COBOL, BASIC, Pascal, PL/1, C, and Assembler.

The Center for Instructional Technology

Mina B. Ghattas, Ph.D., *Director*

The Center for Instructional Technology (CIT) is a multi-service unit whose mission is to support and enhance teaching and learning activities at the University. CIT is comprised of the following three divisions that provide faculty and students with a comprehensive range of instructional support services.

Office of Instructional Development and Evaluation

The Office of Instructional Development and Evaluation (O.I.D.E.) assists individual faculty and departments in designing, developing, and evaluating instructional processes or products. It provides course/teaching evaluation and teaching improvement services through the Teacher/Course Evaluation Project (TCEP). It provides workshops and seminars on teaching/learning issues for faculty and assists other offices in the development of training activities for the University community. This division also provides consultation on, and coordination of, the production of instructional materials and media of all kinds; and offers consultation and assistance in materials, course, curriculum, program, and other types of evaluation.

Instructional Media Production, Training, and Utilization Services

Instructional Media Production, Training, and Utilization Services provides training and assists faculty, staff, and students in the production of presentational media materials, e.g., graphics, 35mm slides, slide/tapes, overhead projectors, portable video, etc. and provides professional graphics and photography services. This division also identifies, previews, acquires, and maintains 16mm films, videocassettes, filmstrips, slides, multi-media units, and other technology-based instructional materials. It coordinates rental of 16mm films and videotapes from outside sources; maintains a preview facility for individual or small-group use; and offers orientations, media demonstrations, and training workshops to University groups.

Campus Media Services

Campus Media Services makes available and coordinates the distribution of all types of audiovisual equipment and instructional media materials for the support of classroom instruction on a prescheduled basis. Equipment includes film, filmstrip, slide, opaque, and overhead projectors, audio and videotape recorders, video cameras, monitors and projectors, portable public address systems, telelecture equipment, record players, and projection screens. This division also provides training in the operation of audiovisual equipment and distributes instructional materials from the collection owned by the University, such as 16mm films, videotapes, filmstrips, slides, and audio cassettes. A catalog of Northeastern owned instructional materials is available at no charge.

Office of Minority Student Affairs

Keith Motley, M.S. Ed., *Director*

The Office of Minority Student Affairs was created in 1968 to respond to the special needs of minority students in the North-eastern community. Contact with minority students is established prior to registration, continues throughout the first academic year at Northeastern, and thereafter is maintained and encouraged as long as the student wishes.

The staff of the Office of Minority Student Affairs provides assistance and guidance in academic matters such as registration, scheduling of courses, choosing an academic program, and developing academic assistance, as well as financial, social, and career counseling. The office is also a link between minority students and other departments within the University and assists in the resolution of problems that arise with faculty, staff, or administrators. In this context, the office helps to make the students' personal and academic environment conducive to educational growth.

The academic performance of all black freshmen is monitored within the Office of Minority Student Affairs and the determination is made as to whether or not a student is in good academic standing, to be placed on probation, or dismissed from the University.

For more information about the Office of Minority Student Affairs, call 617-437-2787.

Office of Multicultural Student Affairs

Roland E. Latham, C.A.G.S., *Dean*

The Office of Multicultural Student Affairs has been created for the purpose of more efficiently meeting the needs of Third World students. The Office oversees the coordination and implementation of support services provided by the English Language Center and the International Student Office. Moreover, the Office of Multicultural Student Affairs provides advocacy representation at the upper level of University administration, thereby insuring that international and non-foreign second-language students' needs are being comprehensively addressed.

The International Student Office

Sally M. Heym, B.A., *Director*

The International Student Office provides a wide variety of services for the more than 2,000 foreign undergraduates, graduates, and faculty at Northeastern. Specific services range from counseling international students regarding immigration regulations and

academic, financial, and personal concerns, to issuing forms and official documents which students use to transfer funds from home and travel outside the United States.

The ISO is also a center for international student activities and sponsors such events as ski trips, dinners, tours, picnics, and an International Week in the Spring. It also publishes a quarterly newsletter.

The ISO strives to promote cultural understanding among international students and Americans by presenting cross-cultural communication workshops, orientation programs, and activities. The ISO also acts as a liaison between the various departments and colleges and the many different public and private agencies which have concern for the affairs of foreign nationals in the academic community.

International Student Information

The University welcomes qualified students from other countries who are adequately prepared to benefit from the educational, cultural, and social opportunities it has to offer. Currently, almost 2,000 international students from 109 countries attend Northeastern.

Northeastern University is authorized under federal law to enroll non-immigrant aliens as full-time students in degree-granting programs of its basic undergraduate colleges and graduate schools. Part-time and special students are not included in this authorization.

The University evaluates the educational and financial qualifications of prospective students from foreign countries. The International Student Office, the English Language Center and the International Cooperative Education Office administer to the special needs of foreign students.

International students who have never attended an institution of higher learning or who have already attended college or university and wish to transfer to Northeastern should write to the Department of Undergraduate Admissions for information and application materials. Applicants who have already received a degree or diploma from a university or college and seek information concerning graduate schools at Northeastern should write to the specific graduate school in which they are interested.

University admissions policies for international students are found on page 255.

In general, the University does not have financial aid for non-U.S. citizens for undergraduate study. It does offer Ambassador Awards to international students of outstanding academic achievement in secondary school (see page 255).

English Language Center

Paul C. Krueger, C.A.G.S., *Director*

The English Language Center provides an important resource for international students at Northeastern. Its goal is to ensure that students who speak English as a second language are proficient enough to carry on full-time studies in a degree program without language-related problems. The center administers the intensive English program, which offers three levels of intensive, noncredit courses in English as a second language—beginning, intermediate, and advanced. Intensive English classes are open to undergraduate and graduate students, as well as to students who come to Northeastern to study English only. Those students also admitted to a degree program in the University may take, with the approval of the director of the English Language Center, courses for credit while studying Intensive English at the advanced level.

The Intensive English program offers twenty hours of classroom instruction per week, as well as a number of special services. The weekly program includes classes in English structure, reading, writing, listening, and speaking skills, as well as small group tutorials, practice in a language laboratory and in a writing laboratory, and help from a pronunciation specialist as needed. English Language Center staff work closely with staff from the International Student Office, other offices in Student Affairs, the academic departments, and other University services.

In addition to serving students, the English Language Center provides advice and consultation to the Northeastern community at large. Center staff are available to answer questions from teachers, administrators, and students and are able to design special programs for special needs at short notice.

For more information about the English Language Center call 617-437-2455.

University Health Services Lane Health Center

Job E. Fuchs, M.D., *Director*

A comprehensive program of medical care is provided to all full-time registered students in the Basic Colleges, both graduate and undergraduate. The University maintains a Health Services Clinic in the Forsyth Building, Room 135, which is open for emergencies at all times and is equipped to deal promptly with any medical condition that may arise. All entering students must submit a pre-entrance physical examination form provided by the Lane Health Center prior to registration. Failure to fulfill this requirement can delay registration and result in a penalty fee and an additional fee for a physical examination. Regular clinic hours for

the student body are held by staff physicians from 9:00 a.m. to 4:30 p.m., Monday through Friday. Health Services can be reached at all times by telephoning 617-437-2772.

Specialty clinics in surgery, orthopedic surgery, gynecology, and fertility control and planning are scheduled at specified hours. Please check times with the Health Services office. Pregnancy testing and venereal disease diagnosis and treatment services are always available during clinic hours. Allergy testing and treatment for students with allergic problems are done at the Lane Health Center at no cost except for a nominal fee for the cost of the extracts. Allergic desensitization injections using extract provided by the student's own physician will be given at no cost provided the extract is received in good condition, properly labeled, and with a dosage schedule. Consultation with the various medical and surgical specialists who are not physically present in the clinic will be arranged when deemed necessary by a Health Services physician. The cost of the first visit will be borne by the Health Services.

Special X-ray and laboratory procedures that are unavailable in the Health Services but are deemed necessary by a staff physician will be provided. A full spectrum of mental health services is available. A mental health specialist is present daily, and students are urged to use this service even for minor emotional upsets.

All full-time graduate and undergraduate students are covered by a special Blue Cross and Blue Shield policy, which remains in effect continuously from the day of initial registration until the first of the month following withdrawal, dismissal, or graduation. Married students are urged to go to the Finance Office (249 Richards Hall) to purchase supplementary coverage for dependents.

An infirmary is also maintained in the Forsyth Building for the care of students living in University dormitories and apartment houses. The required infirmary fee entitles students to twenty days' care in the infirmary at no additional charge.

Students are urged to come to the clinic during *regular* clinic hours in order to take advantage of all of our facilities.

Office of Services for the Handicapped

Ruth K. Bork, M.Ed., *Director*

Very often, the degree of physical accessibility and types of available support services play an important part in a disabled student's selection of a college. An examination of Northeastern University's campus map shows the buildings to be located within relatively close proximity to one another. Nearly all buildings have elevators that are open to use by all. A special advantage at Northeastern is the existence of a tunnel system, constructed prior

to 1965, that links most buildings; in the harsh New England winters and during inclement weather, this proves to be a welcome feature to all.

Any student who has a disability-related special need—no matter how small or individual—can receive ready support services from the Office of Services for the Handicapped (OSH). Frequently, students are uncertain about how they may be aided by this office, and in these situations a discussion of possible alternatives can be quite helpful. OSH provides a wide range of support services to eliminate the competitive disadvantages that a disability may create. Services are individually tailored to meet the needs of each student.

If you have a disability, you are strongly urged to meet with the staff in OSH early on in your consideration of Northeastern. Together, you can discuss the types of service that would best meet your needs, and you will have an opportunity to see the campus firsthand. If a visit is not possible, contact the OSH Director by phone or by mail to avoid the unnecessary delays and confusion that may arise with last-minute adjustments; telephone: 617-437-2675 (voice) or 617-437-2730 (TTY).

The following types of assistance are available from the Office of Services for the Handicapped:

Orientation—Tailored to the needs of specific disability groups, orientation utilizes tactile maps for vision-impaired students, interpreters for hearing-impaired students, and accessible routes of travel for mobility-impaired students.

Registration and Preregistration—Assistance to help ensure class accessibility and course adaptation.

Counseling—Personal, academic, and referral services.

Housing—Necessary modification in residence halls.

For the Visually-Impaired Student—OSH assists in securing taped and braille textbooks and materials; readers; campus orientation; tactile maps; and auxiliary aids such as braille, Visualtek reader, raised-line drawing kits, large-print typewriter, talking-book machine, magnifiers, talking calculators, variable-speed tape recorders, and Kurzweil Reading Machine.

For the Hearing-Impaired Student—OSH offers services including oral and sign language interpreters; note takers; TTY; audiometric testing, hearing-aid evaluation, fitting, and orientation; instruction in sign language and speech reading; speech therapy. Sign language interpreting and oral interpreting services will be provided to deaf and hearing-impaired students only after they have been denied such services by their Division of Vocational Rehabilitation, provided the Office of Services for the Handicapped has received information documenting the reason for such denial.

For the Learning Disabled Student—OSH assists in securing taped textbooks and materials; readers; untimed testing; assistance in securing course and program modification. Services will

be provided only upon receipt of diagnostic testing, documentation, and prescriptive write-ups. Students without this material can be referred to appropriate agencies for testing.

For the Wheelchair User/Mobility-Impaired Student—OSH offers information on appropriate routes of travel, assistance in relocating classes, adaptive physical education, and physical therapy.

General Assistance Services—Includes scribes; advocacy liaison with instructors and other University staff; HP parking; corrective tutoring in English writing, reading, and language problems; special examination situations.

Information Clearinghouse—Offers articles, periodicals, books, and other literature for, about, and by disabled individuals.

The Office of Services for the Handicapped is also the gathering place for the Disabled Student Organization of Northeastern University, which works cooperatively with OSH to plan programs and improve accessibility of services for handicapped persons at Northeastern.

Department of Career Development and Placement

Sidney F. Austin, M.Ed., *Dean and Director*

The Department of Career Development and Placement offers a wide range of counseling and placement assistance to all seniors and alumni of Northeastern University seeking employment or admission to graduate or professional schools, and to students interested in participating in nonpaid, part-time internships in private or public nonprofit agencies for which they may receive academic credit. The department also administers Professional Experience/Cooperative Education programs for University College students and MIS students in graduate engineering.

Through this department, representatives of hundreds of employers are scheduled to visit the campus each year to interview seniors and graduate students for full-time employment after graduation. A job bank of currently available positions is maintained for seniors or alumni who are seeking opportunities for which they may be qualified. Credential service is provided for students and alumni seeking positions in fields that require them and for applicants to graduate and professional schools. Regularly scheduled seminars are conducted for seniors and alumni on career development, job-finding techniques, resume preparation, and effective interviewing. Individual career counseling is available for seniors and alumni of all University programs.

Life/Career Planning Program

Joseph E. Barbeau, Ed.D., *Director*

The fundamental mission of the Life/Career Planning Program is to offer students a variety of career-related services. Those who may be undecided about their academic major or career direction or who want to explore career options and formulate postgraduation plans may elect any of several courses which are open to all undergraduate majors. Students needing assistance with résumés, interviewing, cover letters, or job survival techniques may attend regularly scheduled workshops or may use the drop-in résumé critique service of the Career Resource Center. Also available in the Center is an open-shelf collection of print materials and a computer terminal for obtaining information on jobs and careers, financial aid, and graduate and professional schools.

HELP Legal Service

HELP Legal Services Plan offers low-cost legal services to undergraduate students at greatly reduced rates. The annual membership fee is \$15. Complete confidentiality is assured. Service is available Monday–Friday, 10 a.m.–5 p.m., Room 264, Ell Center, telephone 437-2636.



Student Activities

Student Activities at Northeastern

The University regards student activities as an integral part of education and provides for a range of activities to spark your interest and satisfy your inclinations: you are given the opportunity to play intramural sports on a wide variety of teams; write for the *Northeastern News*; broadcast over WRBB, the student-operated radio station; act, dance, sing, play music, or become involved with student government.

The University encourages relaxation and socializing: you can meet new friends by joining any of the more than 150 campus clubs and organizations, attend a lecture, a film, or a play, or go skiing or camping in the mountains. Once you begin to take advantage of what is available on campus, there's no telling what you will learn or whom you might meet.

If you are a commuter student, it is likely that a good portion of your between-class time will be spent in the Carl S. Ell Student Center. The dominant feature of the main level of this "student building" is the magnificent main lounge. Five stories in height, the lounge will comfortably seat 800 students—a good place for quiet conversation or contemplation. Below the lounge are a cafeteria and Club Ell, where free films and live entertainment are provided on a regular basis. In addition, the center has a ballroom, a piano practice room, a large gameroom with billiards and table tennis equipment, study rooms, a typing room, a computer room, and many meeting and function rooms. The Information Booth staff can help with any questions and also offers printing and photocopying services. The Student Center is that part of Northeastern University where you can relax and really feel comfortable and at home.

Each Monday and Thursday, the hours between 11:30 a.m. and 1:30 p.m. are reserved for student activities. No classes are held during these times, to allow students an uninterrupted period of time for themselves. Student clubs, intramural sports, cultural events, and many other activities are scheduled to provide opportunities to make spontaneous or planned use of your time. You have the chance to become involved in campus activities, whether you reside in the residence halls or are a commuter, without interfering with your academic commitments.

Student Organizations

All-University Activities

- Council for University Programs
 - Concert Committee
 - Committee for Alternative Programs
 - Lecture Committee
 - Publicity Committee
 - Special Events Committee
- Interresidence Council
- NU Freshman Orientation Staff
- Student Alumni Association
- Student Government Association
 - Budget Review Committee
 - Student Affairs Committee
 - Student Center Committee
 - Student Court

Artistic and Musical Organizations

- Band
- Choral Society
- Dance Theatre
- Early Music Players
- Orchestra
- Silver Masque

Departmental and Academic Organizations

- Arts Association
- Association for Computing Machinery
- Beta Biological Society
- Black Business Student Association
- Black Engineering Student Society
- Business Student Advisory Committee
- College of Nursing Student Organization Council
- Co-op Student Advisory Committee
- Criminal Justice Advisory Council
- Criminal Justice Student Security Organization
- Economics Club
- English Club
- Finance Club
- Forensic Students at Northeastern University
- Health, Sport, and Leisure Club
- Human Resource Management Club
- Human Services Student Organization
- International Co-op Exchange Program Advisory Committee
- Marketing Club
- Medical Laboratory Science Club
- Physical Therapy Club

Physical Therapy Yearbook
Physics Club
Political Science Student Advisory Committee
Public Relations Student Society
Respiratory Therapy Club
The Script (Physical Therapy Yearbook)
Society for the Advancement of Communication Studies
Sociology/Anthropology Students Association
Speech and Hearing Club
Student Athletic Trainers Association
Student-Faculty Biology Relations Committee
Student National Medical Association

Political and Social Action Organizations

Federation of Massachusetts College Republicans
Students Against Nuclear Warfare
Students for Environmental Awareness
Students for Life

Media

Cauldron
Northeastern News
Onyx
Spectrum
WRBB-FM

Special Interest Clubs

Amateur Radio Club
Association of the U.S. Army
Brothers of Apple Social Interest Group
Camera Club
Cheerleaders
Chess Club
Disabled Students Organization
Downhillers Ski and Sports Club
Flying Club
Future Black Lawyers Society
Groove Phi Groove Social Fellowship
Hus-Skiers and Outing Club (NUHOC)
Naval Science Association
Northeastern University Organization for Alternative Lifestyles (NUAL)
Pershing Rifles
Sailing Club
Semper Fidelis (Marines) Club
Tactical Society
Terra Society
Underwater Society
Women's Center

Religious Organizations

Bahai Club
Campus Crusade for Christ
Chi Alpha Christian Fellowship
Christian Science Organization
Christian Student Association
Hillel
Islamic Society
Maranatha Ministries
Navigators
Newman Association
Nichiren Shoshu of America
Seekers Christian Fellowship

Ethnic and Cultural Clubs

Arab Heritage Cultural Club
Armenian Club
Association of Students from the Indian Sub-Continent
Caribbean Student Organization
Chinese Student Club
Haitian Student Unity
Hellenic Club
International Students Forum
Iranian Student Organization
Irish Club
Korean Student Organization
Latin-American Student Union
Lebanese Student Association
National Black Student Association
Persian Student Society
Turkish Students Organization
Vietnamese Students Organization

Fraternities

Alpha Epsilon Pi
255 Ell Center

Alpha Kappa Sigma
29 Greenough Ave.
Jamaica Plain, MA 02130
524-9869

Beta Gamma Epsilon
234 Commonwealth Ave.
Boston, MA 02116
262-1639

Gamma Phi Kappa
11 Vancouver St.
Boston, MA 02115
427-8774

Iota Phi Theta
255 Ell Center

Kappa Alpha Psi
255 Ell Center

Nu Epsilon Zeta
255 St. Paul St.
Brookline, MA 02146
566-9804

Phi Beta Sigma
255 Ell Center
(Colony)

Phi Gamma Pi
241 Kent St.
Brookline, MA 02146
566-8970

Phi Sigma Kappa
37 Greenough Ave.
Jamaica Plain, MA 02130
524-9893

Tau Kappa Epsilon
P.O. Box 834
Allston, MA 02134
254-3431

Zeta Beta Tau
42 Chestnut Square
Jamaica Plain, MA 02130
522-5162

Sororities

The recognized sororities and colonies for women play an important role in the extracurricular life of the University. Although none has a separate house, they can all be reached through the Office of Student Activities, Room 255 EC, at the University. The names of the sororities follow:

Alpha Kappa Alpha
Delta Phi Epsilon
Delta Sigma Theta
Sigma Beta Epsilon
Sigma Gamma Rho
Zeta Phi Beta

Sports

The University provides opportunities for participation in athletic programs that correspond to the abilities and inclinations of most students. We especially wish to provide each of you with the chance to develop skills and competence for lifelong athletic pursuits. Along with many casual, drop-in opportunities, you can participate as a member of intramural teams. Examples of intramural sports include touch football, basketball, volleyball, soccer, ice hockey, wrestling, softball, and track.

Professional Societies

Students will benefit in many ways by joining the student chapter of a professional society in an area of study of particular interest to them. They have the opportunity to keep up with the latest developments by listening to authorities in that field, to exchange ideas with students from other colleges and universities as well as from Northeastern, and to learn more about professional standards.

If students take an active part by attending regular meetings and social affairs, they may become officers or members of a delegation to meetings outside the University. Such participation may prove invaluable in shaping a career.

The following professional societies, the majority of which are national organizations, are open to upperclassmen in their respective professional fields:

American Chemical Society
American Institute of Chemical Engineers
American Institute of Industrial Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
Engineers Council
Institute of Electronic & Electrical Engineers
Public Relations Student Society
Society of Professional Journalists
Society of Women Engineers
Student American Pharmaceutical Association

Men's Athletics

Whether it be on the SuperTurf at Parsons Field in the fall, the ice or hardwood of the Matthews Arena in the winter, or the waters of the picturesque Charles River in the spring, a Northeastern athletic team is a familiar sight, either training or competing, nearly twelve months of the year in the Greater Boston area.

Husky varsity entries have touched down on some prestigious athletic real estate, such as Henley-on-the-Thames, England; Madison Square Garden, New York; and Fenway Park, which is part of Northeastern's Back Bay neighborhood. In fact, one could include the Montreal Olympic Village in the summer of 1976, and the most recent summer Olympiad in Los Angeles, when an alumnus oarsman stroked his way to a silver medal for the United States.

All students are urged to participate in the University's athletic program, which recently added soccer to its list of varsity sports. The University fields teams in baseball, crew, swimming, soccer, cross-country, track and field, football, hockey, basketball, and golf. On the intramural and club levels, students may also participate in such sports as basketball, softball, volleyball, soccer, ice hockey, flag football, and aerobics.

Facilities include the spacious Cabot Physical Education Center, Edward S. Parsons Field, the Matthews Arena and the recently completed Bernard and Jolane Solomon outdoor track and field facility in Dedham. The Cabot Gymnasium contains four basketball courts, three weight rooms (Nautilus, free weights, and universal) a wrestling and martial arts room, a cage for indoor track and soccer, and four modern racquetball courts.

Parsons Field, home of the Huskies' football team, with its new SuperTurf surface, also features the Northeastern baseball diamond. The Dedham track has an eight lane, Action Trak 200 running surface, and an expansive area for concurrent jumping and field events. The new outdoor facility is ready to host dual and championship meet competition, and is a permanent site for Northeastern track athletes.

The hockey and basketball teams play their home games in the historic "Boston Arena"—now the Matthews Arena, named for University benefactors George and Hope M. Matthews. The arena is located near the main quadrangle of the campus. It provides a portable floor for the Husky basketball team and daily free public skating.

Matthews Arena is the oldest ice hockey rink in the world, and features a seating capacity of 6,000 and some of the finest sight lines of any rink in the country. Within the past three years, both the men's basketball and hockey teams surged to NCAA Championship play under the roof of the Matthews Arena.

Northeastern annually fields one of the most competitive Division I-AA football teams in New England, and as an Independent has always played a demanding schedule. A partial list of the Huskies' most recent opponents includes New Hampshire, Massachusetts, Lehigh, Richmond, Youngstown State, and The Citadel.

The University's hockey team skates in the brand new Hockey East Association, the eastern college hockey alignment which includes three Boston based teams and a total of seven teams from New England. Along with city rivals Boston College, Boston University, and Harvard, the Huskies spend the first two Monday nights in February playing in the prestigious Beanpot Hockey Tournament before a packed Boston Garden house. In 1985 the Huskies became the first team to win back-to-back Beanpots since 1979.

Northeastern's basketball Huskies wage their roundball wars in the tough ECAC North Atlantic Conference of the NCAA. They play the local powers such as Boston College and Boston University, and recent tournament soirees have included games with national powers such as Illinois, Ohio State, Maryland, and Oklahoma. Even against the cream of the East, Northeastern has had twenty winning seasons in the last twenty-three years and has participated in five of the last six NCAA Championships.

To discuss track and cross country in New England is to talk about Northeastern track and cross country. The Huskies, who defended their Greater Boston Championship last January, have been the flagship program on the New England track and field scene for the last decade and a half; in that stretch, the Huskies have captured eight New England indoor titles and seven outdoor championships. Each year, Northeastern is represented by alumni running for national and international honors as members of top track and field clubs.

Northeastern also fields a strong golf team which competes in all the major Eastern tournaments.

The most amazing Husky sports story, however, is that of var-city crew. In 1965, its first season, the NU crew won four of five regattas and the small college rowing championships, and became the first NU team to compete internationally when it rowed in the Henley Royal Regatta. The next year, the Huskies moved into the major college rowing league. They culminated their swift rise by winning the Eastern Sprints in 1972 and 1973 and rowed in the finals of the Grand Challenge Cup of the Henley Royal Regatta. In 1973, they were considered the finest eight in the country. In 1978, the freshman crew won the Eastern Sprints and was invited to row the Thames Challenge Cup race at Henley.

Northeastern has buttressed its physical fitness facilities campus-wide and accommodates the daily influx of undergraduates, graduates, staff, and faculty at Cabot Gymnasium and the Matthews Arena. One of the most popular accoutrements is the Barletta Natatorium, home of the Husky swim team. This fine aquatics facility is equipped to handle varsity swim competitions, handicapped swim programs, recreational swims, and water polo.

Women's Athletics

From a very small program with very few resources, the Northeastern University women's intercollegiate athletic program has grown rapidly, reflecting recent tremendous growth in women's athletics at all levels. The program now encompasses twelve sports: basketball, crew, cross-country, field hockey, gymnastics, ice hockey, lacrosse, swimming and diving, tennis, track and field (indoor and outdoor), and volleyball.

As members of the NCAA, Northeastern University subscribes to all policies and regulations of the Association. Athletic scholarships are available to women student athletes in all programs.

Northeastern's goal is to provide an excellent program of athletics for all women students who qualify. Our programs are in the mainstream of the exciting growth in women's athletics throughout the country.

In the past year, our field hockey team, using the SuperTurf at Edward S. Parsons Field in Brookline as their home field, have charged forward to finish the season in the nation's top twenty. The basketball team, perennially strong, won the Seaboard Conference Championship. The volleyball team qualified for the NCAA Championship in Division II, and has taken on the tough job of moving to Division I.

Our crew accomplished a significant turnaround, becoming one of the strongest boats in the East. The ice hockey team, which makes its home in the beautifully renovated Matthews Arena, is always one of the top three in the country; it has won the Women's Beanpot Tournament in four of the past six years.

Moving toward excellence in all programs, Women's Athletics looks forward to an exciting year. Specific policies and guidelines relating to academic eligibility for athletic participation will be distributed in writing to all student athletes.

Religious Life

Northeastern has genuine concern for the religious and moral development of students of all faiths. A Religious Advisory Board, consisting of administrators and faculty, as well as full-time guest chaplains, seeks to articulate the needs in this area and facilitate the work of various religious groups on campus. A Chaplains' Association, consisting of the full-time chaplains, works cooperatively to emphasize the interfaith dimensions of campus life.

The chaplains also deal with students on a denominational basis at various centers near the campus: Episcopal College Work Center in Brookline; Jewish-Hillel House on Parker Street; Lutheran Center, 84 The Fenway; and St. Ann's Roman Catholic Parish and Student Center on St. Stephen Street. In addition, there are numerous religious student organizations on campus listed under "Student Organizations."

Interfaith services to commemorate special days and events are held in the Bacon Memorial Chapel, located in the Ell Building. The Chapel is also used for denominational worship services and special lectures on religion. It is open daily for prayer and meditation and is a setting for weddings of students and alumni.



General Information

History

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the state legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of almost two hundred distinguished business and professional men and women. The Board of Overseers, chosen from the membership of the Corporation, based on their exceptional interest in and support of the University, is also a participant in the affairs of the institution.

From its beginning, Northeastern University's dominant purpose has been the discovery of community educational needs and distinctive and serviceable ways of meeting them. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan of Education, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration, Arts and Sciences, Education, Pharmacy, Nursing, Boston-Bouvé College of Human Development Professions, the College of Criminal Justice, the School of Engineering Technology's daytime Bachelor of Engineering Technology Program, the College of Computer Science, and by University College in a special pilot program. This educational method offers students the opportunity to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The plan has been extended to the graduate level in criminal justice, engineering, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, the University offers graduate and undergraduate degree programs and noncredit programs that are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, the School of Engineering Technology, and University College are approved by the undergraduate faculties concerned and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, the Dedham Campus, and at other off-campus locations near Boston.

Academic Policy

Policy on Changes of Program	<p>The University reserves the right to withdraw, modify, augment, or change the order or content of courses in any curriculum.</p> <p>It further reserves the right to change tuition, and fees charged, and other regulations.</p> <p>Any changes which may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.</p>												
Textbooks and Supplies	<p>The Northeastern University Bookstore, located on the ground floor of the Ell Student Center, is a department of the University and is operated for the convenience of the student body. All books and supplies that are required by the students for their work in the University may be purchased at the Bookstore.</p>												
The Academic Year	<p>Northeastern University operates on a quarter-system calendar.</p>												
Quarter-Hour Credits	<p>All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit.</p>												
Grades and Examinations	<p>Examinations covering the work of the quarter usually are held at the close of each quarter. Exceptions may be made in certain courses where, in the opinion of the instructor and with the approval of the dean of the college concerned, final examinations are not necessary.</p>												
Pass-Fail System	<p>Students may register for a limited number of courses on a pass-fail basis. Each college has its own rules governing this system. Common to all colleges, however, is the grading system. Pass-fail grades are not included in the calculation of the quality point average. Only pass grades earn credits toward degree requirements. (Pass-fail guidelines are also stated in the <i>Student Handbook</i>.)</p>												
Grades	<p>A student's grade is officially recorded by letter. Introduced in September 1980, the following grades, listed below with their numerical equivalents, are in effect:</p> <table><tr><td>A</td><td>4.000</td></tr><tr><td>A-</td><td>3.667</td></tr><tr><td>B+</td><td>3.333</td></tr><tr><td>B</td><td>3.000</td></tr><tr><td>B-</td><td>2.667</td></tr><tr><td>C+</td><td>2.333</td></tr></table>	A	4.000	A-	3.667	B+	3.333	B	3.000	B-	2.667	C+	2.333
A	4.000												
A-	3.667												
B+	3.333												
B	3.000												
B-	2.667												
C+	2.333												

C	2.000
C-	1.667
D+	1.333
D	1.000
D-	.667
F	0

A general average of C- is not acceptable and will not allow a student to continue at Northeastern University.

Freshman students who are taking a full academic program and who have a weighted average for the year below 1.4 will not be permitted to register for advanced work. Upperclass students should consult the *Student Handbook* to ascertain the level of continuing achievement required of them by the faculty of their college.

An I, or X (Incomplete), grade is used to show that the student has not completed the course requirements.

An official University grade report is mailed to each student at the end of each quarter.

Transcripts

Applications for transcripts of record are made at the Registrar's Office (120 HA). A charge of \$2.00 is made for each transcript request.

Middler-Year Writing Requirement

All Basic Day College students must successfully complete the Middler-Year Writing Requirement, effective the Fall Quarter of 1986 for all students, including transfer students.

The Middler-Year Writing Requirement is required for graduation with a bachelor's degree. A prerequisite for the Middler-Year Writing Requirement is the successful completion of Freshman English (or equivalent).

In addition, the Middler-Year Writing Requirement may *not* be fulfilled until the student has successfully completed at least 80 quarter-hours of academic work (including transfer credit), and the requirement *must* be fulfilled at Northeastern.

As defined by each college, the Middler-Year Writing Requirement may be fulfilled by passing one designated, upper-division writing course (four quarter-hour course with a grade of C [2.0] or better) or by passing the ENG 1340, Writing Workshop course (one credit pass/fail). Upperclass students should consult their college adviser or the Middler-Year Writing Requirement Office in the English Department to see which option applies to them.

The *Basic Day Colleges Course Description and Curriculum Guide* and *The Student Handbook* specify the details of the writing requirement for both entering freshmen and transfer students.

Dean's List	<p>An Honors or Dean's List is issued at the end of each quarter containing the names of students who have a 3.0 quality-point average or higher, with no "I" grade or grade below C-. A student who is on any form of probation, enrolled in a course on a pass-fail basis (except where there is no alternative or where required by the program), or not carrying a full load as determined by his or her Basic College will not be eligible. With few exceptions, as approved by the respective Colleges, a full load is normally considered to be four courses or sixteen quarter-hours.</p>
	Dean's List Cum Laude 3.000–3.499
	Dean's List Magna Cum Laude 3.500–3.749
	Dean's List Summa Cum Laude 3.750–4.000

Beginning with the Class of 1990 and all future classes, the minimum quality-point average to achieve Dean's List status will be 3.25.

Dean's List Cum Laude	3.250–3.490
Dean's List Magna Cum Laude	3.500–3.740
Dean's List Summa Cum Laude	3.750–4.000

Reports on Scholastic Standing	<p>Reports for all students are issued at the end of each grading period. Questions about grades are to be discussed with the student's faculty adviser.</p> <p>At the end of the academic year, juniors will receive, in addition to their term reports, a complete cumulative copy of their permanent records. Students should contact the dean of their college, if discrepancies are found.</p> <p>Students are constantly encouraged to maintain an acceptable quality of college work. Parents and students are always welcomed by the college officers and faculty advisers for a conference upon such matters.</p>
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Family Educational Rights and Privacy Act	<p>In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the <i>Student Handbook</i>, which is distributed annually at registrations.</p> <p>It is the policy of Northeastern University to deal with the student in all academic and administrative matters. If parents require any information regarding the progress of their son or daughter, they may contact the Dean of Students' Office.</p>
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General Conduct	<p>It is assumed that students come to the University for a serious purpose. The University community expects each student to respect the rights and privileges of others and to adhere to acceptable standards of personal conduct. Students should exercise their freedom with maturity and responsibility. They are expected to</p>
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obey University regulations and follow the instructions of and pay due respect to University officials. Conduct inconsistent with the general order of the University may result in disciplinary action. Damage to any building or to any of the furniture, apparatus, or other property of the University will be charged to students involved.

Any form of academic dishonesty is regarded as a most serious offense and renders the offender liable to disciplinary action. Aiding and abetting a student in any dishonesty is also held to be a grave breach of discipline.

The University administers discipline with a high standard of integrity and a scrupulous regard for truth.

Attendance

Students are expected to attend all meetings of their classes. Absence from regularly scheduled classes may seriously affect the standing of the student and result in the University's dropping the subject or subjects from his or her schedule. Laboratory work can be made up only during hours of regularly scheduled instruction.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), WRKO (680), and FM stations WBCN (104.1), WROR (98.5) are the stations authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

Policy on International Programs and Services

Northeastern University, a world leader in cooperative education, acknowledges the increasing interdependence among nations, and, therefore, identifies its mission as preparing its graduates to live and work in an interdependent world. The University deems it essential that its students, both in the professions as well as in the humanities, develop a greater awareness and understanding of those social, political, and economic issues that transcend national boundaries. So interconnected are these issues that a recognition of them coupled with an appreciation of the diverse cultures which gave rise to them is necessary for the development of productive and responsible citizens of the world community.

To accomplish this goal, Northeastern University actively seeks qualified students from abroad to enroll in its undergraduate and graduate programs in such numbers and with such geographic origins so as to create and foster a truly global exchange of ideas and values among students, faculty, and staff.

The University also encourages all colleges to continually develop and expand course offerings to include international issues and cross-cultural aspects and supports faculty to teach and conduct research in the interrelationships among nations and peoples. The University promotes international understanding and the sharing of ideas with institutions throughout the world by virtue of its faculty and staff exchanges and its study and work abroad programs for students.

Finally, the University recognizes that it has a special responsibility to share its expertise and to cooperate with international organizations, the local community, its alumni, and diverse segments of the public in an effort to promote greater awareness of global issues and events.

Alumni Association

More than 100,000 alumni are united within the Alumni Association, created to establish a mutually beneficial relationship between Northeastern and its graduates. The Association is governed by an Executive Committee elected from the alumni community. Membership in the Association is automatic upon graduation.

The Association is headquartered in the Office of Alumni Relations in 125 Richards Hall; telephone 617-437-3186. Addresses of alumni are maintained in the Office of Alumni Records; telephone 617-437-2791.

Activities of the Association include the Homecoming celebration, presentation of the Outstanding Alumni Awards, and the annual presentation of Professional Promise Awards to outstanding seniors in each of the Colleges. Alumni officers, in conjunction with the Office of Alumni Relations, have established a series of enrichment/education programs to meet the contemporary vocational and avocational needs of Northeastern's graduates. The Alumni Association has also initiated a successful group travel program to provide the alumni of Northeastern with interesting and economical opportunities for foreign travel, and sponsors group term life insurance for members of the alumni community. Notice of all activities is provided in the *Northeastern Alumni Magazine* and in special publications.

Regional alumni clubs have been established from coast to coast. All alumni are eligible to become members of these organizations. The clubs meet periodically with varied programs, often in conjunction with professional and athletic events, faculty visits, and service projects. Additionally, alumni class organizations conduct reunions for their respective classes every five years, and Golden Graduates' Day, for senior alumni, has become an annual event.

The association sponsors and assists constituent organizations that focus on common professional and avocational interests and college affiliations. These groups have their own officers and conduct various programs throughout the year.

Regional alumni clubs provide a valuable service to the University by sponsoring admissions conferences for high school students and the parents of students who are interested in attending college. In addition, alumni volunteers in many metropolitan areas across the nation represent the Admissions Office on a continuing basis at high schools and community colleges.

Gifts and Bequests to Northeastern University

Northeastern University welcomes gifts and bequests to further its educational purposes. It is recommended that those contemplating gifts or bequests confer with the University Development Office regarding the needs of the University.

A member of the Northeastern University development staff will be happy to consult with those considering a gift or bequest. Planned gifts to the University can often be combined with personal financial goals to produce maximum financial security, as well as significant tax savings for an individual or family.

The legal name of the University is "Northeastern University." In making a gift or bequest, it is recommended the following wording be used: "Northeastern University, an educational institution incorporated under the laws of Massachusetts and located in Boston, Massachusetts."

ROTC, Military Officer's Education Program

Army

Thomas J. Griffin, III, LTC, U.S.A.; M.B.A., *Professor and Chairman*

General Objectives

The Department of Military Science offers a diverse and exciting program of study, and is available on a voluntary basis to all full-time students. The program's mission is to develop leaders, and thus cultivate traits sought after in many careers: the principles of personnel management, a ready acceptance of responsibility, the desire to achieve, personal confidence, and loyalty. Completion of the program can lead to a commission as a U.S. Army second lieutenant in either the Active or Reserve components.

The ROTC staff consists of active Army officers and NCOs, assigned by the Department of the Army.

Courses of Study

The program consists of the Basic Course (freshman and sophomore years) and the Advanced Course (middles, junior, and senior years) and complements the co-op program by tailoring the courses to the student's schedule.

Enrollment in the Basic Course is voluntary and is open to all full-time students who qualify. Students do not incur a military obligation by participating in the Basic Course.

The Advanced Course is open to all qualified students who meet these prerequisites: (1) completion of Basic Course or approved equivalent, or prior honorable military service; (2) physical aptitude and medical requirements; and (3) age requirements. Advanced Course students receive a \$100 per month stipend up to \$1,000 per year. They are also paid for the six-week advanced camp normally attended between their junior and senior year.

ROTC Scholarships

The Army ROTC scholarship pays for full tuition, provides an allowance for textbooks, lab fees, plus an additional living allowance of \$100 per month up to \$1,000 each year the scholarship is in effect. Selected four-year scholarship winners may also qualify for full room-and-board during their freshman year. Scholarships are available in varying lengths and cover the cadet's remaining academic years. *Noncadets* may apply for scholarships covering their last four, three, or two academic years. These scholarships are merit-based scholarships, and a student's earnings during co-operative work periods do not reduce scholarship payments.

Veterans and Transfer Students

Honorably discharged veterans (enlisted) are a vital part of our cadet corps and will receive special consideration for ROTC entry.

Transfer students, whether or not previously enrolled in ROTC, are also welcome to join our program. They should contact the Department of Military Science concerning their options for program entry.

Uniforms and Equipment

Uniforms are issued without cost to ROTC cadets. A \$35 deposit is required to ensure the return of the loaned property in good condition. Loss or damage to Army equipment, exceeding the deposit, will be charged to the student.

Academic Credits

Regulations of the individual Basic Colleges prevail for ROTC graduation credit. However, students may individually petition their academic department for acceptance of certain courses for graduation credit.

Air Force

Laurence F. Messner, Lt. Col., USAF; M.B.A. *Professor and Chairman, Department of Aerospace Studies, Boston University*

The Air Force Reserve Officer Training Corps (AFROTC) program offers students an opportunity to earn a commission in the United States Air Force. The student is commissioned as a second lieutenant upon completion of both the Aerospace Studies (AS) curriculum and the requirements for an undergraduate or graduate degree. Northeastern University students may enter the AFROTC program as members of either a four-year or a two-year program. Participation in AFROTC by nonscholarship students during the first two years of the four-year program carries no commitment to serve in the Air Force.

The AFROTC program is located at 157 Lake Hall (360 Huntington Avenue), telephone 617-437-4683. Classes are conducted on campus except for a limited number of laboratory sessions held jointly with Boston University students on the B.U. campus.

Four-Year Program

Undergraduates may join the four-year AFROTC program by registering for the appropriate Aerospace Studies classes. Students from all academic disciplines, including five-year co-op, may register. Preferred entry is the first semester, freshman year, although students may enter as late as the first semester, sophomore year.

Freshman classes focus on the functions, organizations, and hardware of the Air Force. Sophomore classes concentrate on the history of aerospace power. Complementing the academic classes is a weekly leadership laboratory, during which students are introduced to Air Force customs, courtesies, drill, ceremonies, and lifestyles.

The Air Force uniform and AFROTC books are provided to the student free of charge except for a refundable uniform deposit.

Continuation beyond the sophomore year is not guaranteed. Factors considered include leadership potential, academic performance, field training evaluations, and results of a physical examination.

The non-flying commissioned graduate incurs a four-year active duty service commitment. Navigators incur a five-year, post-training commitment, and pilots incur a seven-year, post-training commitment.

Two-Year Program

Students unable to participate in the four-year AFROTC program are eligible for the two-year program. Prerequisites for entry into the two-year program include: (1) at least six remaining academic quarters of undergraduate or graduate study; (2) meeting Air Force physical standards; (3) good moral character; and (4) successful completion of six weeks of field training. Applications for

the two-year program require several months for processing. Prospective two-year program members should contact the University AFROTC detachment at least six months prior to proposed entry.

Scholarships

Academic scholarships are available for those who qualify. The College Scholarship Program pays for tuition, textbooks, required fees, and a \$100-per-month, tax-free subsistence allowance. Most scholarships are awarded for four years starting with the freshman year. Application is made while the student is a senior in high school. Application forms should be available in the guidance counselor's office or by writing to the Four-Year Scholarship Branch, Air Force ROTC, Maxwell AFB, AL 36112. Scholarships are also available for students already in college. Students may apply for a three-and-a-half, three, two-and-a-half, or two-year scholarship. Call 617-437-4683 or 617-353-4705 for further details.

Navy

John A. Schmidt, Captain, U.S. Navy, M.S., *Professor and Chairman, Department of Naval Science, Boston University*

The NROTC program at Northeastern University offers a select group of men and women the opportunity to attend one of the finest colleges in the country on a full academic scholarship and to receive a regular commission in the U.S. Navy or U.S. Marine Corps upon graduation. The training of Midshipmen of Northeastern University has two interacting and equally important aspects. The first is the quality training provided by the appropriate departments at Northeastern University. The second aspect is the cross-town professional officer training supplied by the Boston University Department of Naval Science. The Naval Science curriculum is designed to augment regular academic pursuits. In addition, Naval Science laboratory sessions, tours of naval activities, and summer cruises provide added exposure to the naval profession.

Available Programs

The College Program

This program is designed to train Reserve Officers who will serve on active duty for three years after graduation and then retain their commissions in an inactive duty status for an additional three years. This is not a scholarship program, hence no obligation is incurred until commencement of the advance courses of study. At this time a subsistence allowance of \$100 per academic month begins. Students in the College Program are eligible to apply for an NROTC scholarship six times prior to their junior year in college. The Chief of Naval Education and Training selects College Program students twice a year for Professor of Naval Science Scholarships.

The Scholarship Program

This program is designed to educate and train men and women for careers as commissioned officers of the Regular Navy and Marine Corps. Subsistence of \$100 per month during the academic year is received throughout this program in addition to full tuition, textbooks, and most fees. Upon graduation, participants agree to serve a minimum of four years in an active duty status. Although applications for the Scholarship Program are normally submitted at the end of the junior year or early in the senior year of high school, a prospective participant may still qualify for these benefits by enrolling in the College Program and then competing for an NROTC Scholarship.

Eligibility Requirements

To be eligible for the Naval ROTC Program, students must meet these requirements:

1. Be a citizen of the United States,
2. Be at least 17 years old and must not have reached their 25th birthday (27½ for College Program) by June 30 of the calendar year in which graduation and commissioning are anticipated,
3. Be physically qualified in accordance with the standards for entrance,
4. Be a freshman or beginning sophomore at Northeastern University.

In addition there exists a two-year NROTC Program for sophomores/middlers (and transfer students) who did not join NROTC by the start of their sophomore year. These students are sent to a six-week Navy summer school in Newport, Rhode Island, at full Midshipman's pay and allowances, to catch up with their classmates. Selection for this program is on a nationwide basis and all applications must be submitted by late March of sophomore or middler year.

Application Procedures

Students should visit or call the Boston University Naval Science Department Office, 116 Bay State Road, (phone: 353-4232) prior to or shortly after registration day to initiate application procedures.

If the student is beyond the first quarter of the freshman year, he should call or visit this unit for application instructions. If there are any questions, telephone, write, or visit:

Commanding Officer
NROTC Unit, Boston University
116 Bay State Road
Boston, MA 02215
Telephone: 617-353-4232

All inquiries will receive immediate attention.

The Center for Cooperative Education

Paul E. Dube, M.A., M.Ed., *Director*

Educational institutions and other organizations in the United States and abroad that are interested in exploring the concept of cooperative education, implementing new programs, or expanding and improving already existing ones can utilize the services offered by the Center for Cooperative Education. In addition to providing technical assistance, the Center will conduct evaluations of cooperative education programs for both educational institutions and employers.

The center staff is made up of qualified professionals who are familiar with all aspects of cooperative education. Throughout the year, short-term training programs for both new and experienced coordinators of cooperative programs are offered.

The center also handles special projects for the Division of Cooperative Education. An example is the labor market analysis, in which the center, through an established network of contacts, generates information on employment changes affecting employers in business, high tech, and the health industries. The collected data is analyzed and interpreted for use by the entire Department of Cooperative Education. Another example is the recent experimentation with home country placements for international students on cooperative education assignments within the country from which they originate.

Academic Calendar 1986–1987

September 1986	1	Monday	Labor Day. University closed.
	8–12	Monday–Friday	Final examinations for Basic Colleges.
	15–23	Monday–Tuesday	Division B vacation.
	18	Thursday	Fall Commencement.
	22	Monday	Freshman and Transfer students orientation.
	24	Wednesday	Upperclass registration (Division B) 9 a.m.
	24–26	Wednesday–Friday	Continuation of course advising, course registration, course drop/add periods, orientation for college day programs.
	26	Friday	Burlington Campus orientation and course registration.
October 1986	29	Monday	Classes begin in Basic Colleges for Fall Quarter; 8 a.m.
	13	Monday	Columbus Day. University closed.
November 1986	11	Tuesday	Veterans Day observed. University closed.
	27–29	Thursday–Saturday	Thanksgiving Day recess.
December 1986	15–19	Monday–Friday	Final examinations for Basic Colleges.
	22–January 3	Monday–Saturday	Christmas vacation.
January 1987	1	Thursday	New Year's Day. University closed.
	5	Monday	Orientation and registration for new Freshmen and Transfers; registration for continuing September Freshmen and returning Upperclass students.
	6	Tuesday	Registration, orientation, and course drop/add continues until 12 noon.
	7	Wednesday	Classes begin in Basic Colleges for Winter Quarter; 8:00 a.m.
	19	Monday	Martin Luther King, Jr.'s Birthday observed. University closed.
February 1987	16	Monday	Presidents' Day. University closed.

March 1987	23–27	Monday–Friday	Final examinations for Basic Colleges.
	30–April 4	Monday–Saturday	Division A vacation.
April 1987	6	Monday	Orientation and registration for Transfers and continuing Freshmen and returning Upperclass students.
	7	Tuesday	Registration, orientation, and course drop/add continues until 12 noon.
	8	Wednesday	Classes begin in Basic Colleges for Spring Quarter; 8 a.m.
	20	Monday	Patriots' Day observed. University closed.
May 1987	25	Monday	Memorial Day observed. University closed.
June 1987	15–19	Monday–Friday	Final examinations for Basic Colleges
	21	Sunday	Commencement.
	22–27	Monday–Saturday	Division B vacation.
	29	Monday	Registration for Divisions A and D and January freshmen (Quarter Three). Beginning of Summer Quarter.
	30	Tuesday	Basic College classes begin for Summer Quarter; 8 a.m.
July 1987	4	Saturday	Independence Day. University closed.
September 1987	7	Monday	Labor Day. University closed.
	8–11	Tuesday–Friday	Final examinations for Basic Colleges.
	14–22	Monday–Tuesday	Division A vacation.
	17	Thursday	Fall Commencement.
	21	Monday	Beginning of 1987–88 academic year. New student orientation week. Registration and advising week for all returning upperclass students and all new students.
	28	Monday	Classes begin for Basic Colleges for Fall Quarter; 8 a.m.

Calendar dates are subject to change. The University community will be notified if such changes are necessary.

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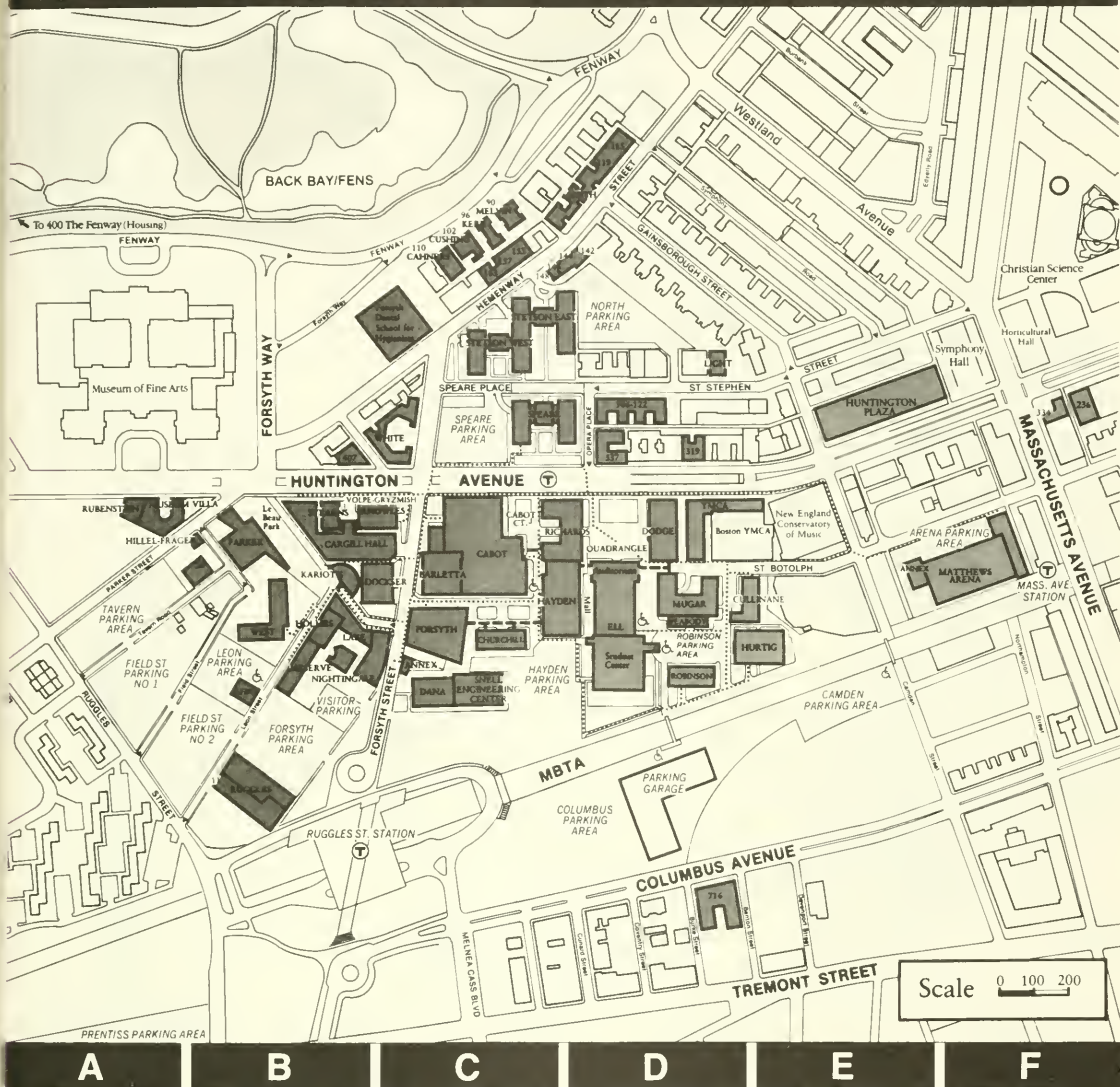
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DE	Boston YMCA (BY)
C	Cabot Physical Education Building (CB)
C	Cahners Hall (CA)
B	Cargill Hall (CG)
C	Churchill Hall (CH)
D	716 Columbus Avenue (CP)
DE	Cullinane Hall (Botolph) (CN)
C	Cushing Hall (CU)
C	Dana Research Center (DA)
B	Dockser Hall (DK)
D	Dodge Library (DG)
D	Ell Student Building (Auditorium) (EL)
D	Ell Student Center (Student Lounge) (EC)
C	Forsyth Building (FR)
C	Forsyth Building Annex (FA)
C	Hayden Hall (HA)
A	Hillel-Frager (HF)
B	Holmes Hall (HO)
F	236 Huntington Avenue (HU)
E	271 Huntington Plaza (HN)

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C	Kerr Hall (Faculty Center) (KA)
B	Knowles Center (Gryzmish Hall) (KG)
B	Knowles Center (Volpe Hall) (KV)
B	Lake Hall (LA)
F	334 Massachusetts Avenue
D	Matthews Arena (MA)
EF	Matthews Arena Annex (MX)
B	Meserve Hall (ME)
D	Mugar Life Science Building (Peabody Health Professions Center) (MU)
D	Nightingale Hall (NI)
B	Parker Building (PA)
D	Peabody Center
D	Richards Hall (RI)
D	Robinson Hall (RB)
AB	Ruggles (11 Leon Street) (RU)
C	Snell Engineering Center (SN)
D	122 St. Stephen Street (SS)
B	Stearns Center (ST)
A	26 Tavern Road (TA)

Key

Academic, Residential,
and Service Buildings

Handicapped Parking

Handicapped Routes

Parking Areas

Public Buildings

Public Parks

Street Direction

Underground Tunnel

Maps are provided by the
Visitor Information Center
115 Richards Hall, extension 2736.
Some buildings on this map are used but
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NUP 6.1.5



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Accreditation

The New England Association of Schools and Colleges accredits schools and colleges in the six New England states. Membership in one of the six regional accrediting associations in the United States indicates that the school or college has been carefully evaluated and found to meet standards agreed upon by qualified educators. Colleges support the efforts of public school and community officials to have their secondary schools meet the standards of membership.

Northeastern University supports the efforts of secondary school officials and governing bodies to have their schools achieve regional accredited status to provide reliable assurance of the quality of the educational preparation of its applicants for admission.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University *Bulletin* contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the re-scheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern University will do its best to make available to you the finest education, the most stimulating atmosphere and the most congenial conditions it can provide. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Tuition and Regulations	Tuition rates, all fees, rules and regulations, courses, and course content are subject to revision by the President and the Board of Trustees at any time.
Antidiscrimination Policy	Northeastern University is committed to a policy of equal opportunity for all students, employees, and applicants for employment without regard to race, color, religion, sex, sexual preference, age, national origin, or handicap or veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance.
Equal Opportunity Employment Policy	<p>Northeastern University is an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, sex, age, sexual preference, national origin, or handicap or veteran status.</p> <p>Northeastern University also prohibits discrimination against any employee regarding upgrading, demotion or transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training. In addition, the University adheres to Affirmative Action guidelines in all recruitment endeavors.</p> <p>Further, Northeastern will not condone any form of sexual harassment, which is defined as the use of unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature, as an explicit or implicit condition of employment, as the basis for employment decisions, or to interfere with an individual's work performance by creating an intimidating, hostile, or offensive work environment.</p> <p>Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of The Rehabilitation Act of 1973, Affirmative Action Office, 175 Richards Hall, 617-437-2133.</p>
Office of Services for the Handicapped	<p>The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees.</p> <p>Northeastern's efforts to comply with the Title IX Education Amendments of 1972 and Section 504 of The Rehabilitation Act of 1973 are coordinated by the Dean and Director of Affirmative Action.</p>

NORTHEASTERN UNIVERSITY, a world leader in cooperative education, acknowledges the increasing interdependence among nations, and, therefore, identifies its mission as preparing its graduates to live and work in an interdependent world. The University deems it essential that its students, both in the professions as well as in the humanities, develop a greater awareness and understanding of those social, political and economic issues that transcend national boundaries. So interconnected are these issues, that a recognition of them coupled with an appreciation of the diverse culture which gave rise to them is necessary for the development of productive and responsible citizens of the world community.

To accomplish this goal, Northeastern University actively seeks qualified students from abroad to enroll in its undergraduate and graduate programs in such numbers and with such geographic origins so as to create and foster a truly global exchange of ideas and values among students, faculty, and staff.

The University also encourages all colleges to continually develop and expand course offerings to include international issues and cross-cultural aspects and supports faculty to teach and conduct research in the interrelationship among nations and peoples. The University promotes international understanding and the sharing of ideas with institutions throughout the world by virtue of its faculty and staff exchanges and its study and work abroad programs for students.

Finally, the University recognizes that it has a special responsibility to share its expertise and to cooperate with international organizations, the local community, its alumni, and diverse segments of the public in an effort to promote greater awareness of global issues and events.

Department of Undergraduate Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone: 617-437-2200

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